

**EFFECTS OF GOVERNMENT DEFICITS IN GREECE**  
(Some theoretical and empirical evidence)

---

by

Angeliki K. Tsouhlou

Thesis presented for the Degree of Doctor of Philosophy  
at the University of Leicester

Leicester

July 1986

*To my parents Dina and Costas*

### Acknowledgments

This thesis could not have been completed were it not for the continuous support of my parents throughout the years of my studies. For this I am going to be forever grateful to them.

I would also like to acknowledge the invaluable assistance provided by my supervisor Prof. P.M. Jackson, and wholeheartedly thank him for his constant guidance and encouragement.

Last but not least, I feel the need to gratefully thank my colleague and friend N. Karavitis for his valuable comments and continuous encouragement.

EFFECTS OF GOVERNMENT DEFICITS IN GREECE  
(Some theoretical and empirical evidence)

---

by

Angeliki K. Tsouhlou

Abstract

The purpose of this study is to examine the effects of the fiscal deficit on the Greek economy. The emphasis is on the inflationary, crowding-out and balance of payments problems that have arisen from the deficits in the budget of the Greek government.

The study starts with the description of the means through which the fiscal stance can be examined and analyses the virtues and the drawbacks of the traditional and the new measures of fiscal stance.

After we describe the characteristics of the Greek monetary system and the structure of the reserve requirements in order to present the relation of the monetary and budgetary policies, we proceed to estimating annual and quarterly measures of fiscal stance for Greece.

We then empirically investigate the relationship between private and government investment, which in general is found to be of a complementary character. Furthermore, we deal with the short-run impact of the fiscal deficit on the output, balance of payment and inflation by using quarterly data.

Finally, the output and price behaviour were examined under the assumption of rationally formed expectations.



## CONTENTS

	page
Introduction .....	1
Chapter I. Measures of Fiscal Stance	
A) Introduction .....	I-1
B) The traditional measures of fiscal stance. ....	I-3
1) The Full Employment Surplus (FES) .....	I-4
2) Fiscal leverage (FL) .....	I-8
3) Fiscal performance measures .....	I-9
4) Weighted standardized surplus (WSS) .....	I-9
5) A mathematical exposition of the FES and WSS .....	I-10
6) The German measure .....	I-22
7) The Dutch Budget Impulse .....	I-23
8) The Swedish approach .....	I-24
9) The recording of transactions .....	I-25
C) The monetary sector .....	I-26
1) Bond Financing .....	I-33
Appendix 1 .....	I-41
Chapter II.	
A) The New Approach .....	II-1
B) Amortization of Public Debt through inflation and currency appreciation .....	II-13
C) Budgetary policy and monetary growth .....	II-17
D) Cyclical corrections to the public sector deficit .....	II-20

E) Conclusion	II-31
Appendix 2	II-34
Appendix 3	II-36

<b>Chapter III. The Greek monetary authorities and the Greek monetary system</b>	III-1
A) A General description	III-1
B) The characteristics of reserve requirements	III-11
C) The monetary effects of the public sector deficit	III-18
D) Conclusion	III-27

<b>Chapter IV. Estimates of summary measures of fiscal influence for Greece</b>	IV-1
A) Problems arising from estimating the FES	IV-1
B) Estimates of the structural deficit for Greece.	IV-17
C) The Budget Margin	IV-31
D) The Budget Impulse	IV-39
E) The cyclical neutral budget (CNB)	IV-49
F) Quarterly estimates of the structural budget	IV-57
G) Conclusions	IV-60
Appendix 4	A-1
A) The fiscal drag	A-1
B) the Estimated regressions	A-4
C) The causality tests	A-5

<b>Chapter V. Government policies and investment</b>	V-1
A) Description of the models	V-1
1) Model I	V-2
2) Model II	V-11

B) Models of financially repressed economies	.....	V-16
C) Private and public investment in Greece.	.....	V-21
D) The model for the Greek economy	.....	V-26
E) The empirical results	.....	V-29
F) The neoclassical model	.....	V-49
G) Conclusions	.....	V-51

## Chapter VI. Balance of Payments, Output, Inflation, and Government Deficit in Greece

	.....	VI-1
A) Stabilization policies	.....	VI-1
1) The choice of policy instruments for purposes of stabilization	.....	VI-4
2) Exchange rates changes	.....	VI-12
B) The Balance of Payments	.....	VI-16
a) Introduction	.....	VI-16
b) The monetary approach to the balance of payments	.....	VI-17
1) Description of the model	.....	VI-23
2) The results from the estimation of the model	.....	VI-31
C) The Current Account	.....	VI-34
D) The Fiscal approach to the current account	.....	VI-41
E) The alternative approach to the balance of payments	.....	VI-55
F) Conclusions	.....	VI-64

## Chapter VII. The Phillips curve and rational expectations for Greece

	.....	VII-1
A) The theoretical model	.....	VII-1
B) The estimated model	.....	VII-6

C) Money Supply, Output and  
Rational Expectations

..... VII-8

1) Model I

..... VII-8

a) The results from the  
        estimated model

..... VII-11

2) Model II

..... VII-16

D) Conclusions

..... VII-21

Chapter VIII. Concluding remarks

..... VIII-1

## Introduction

The purpose of this study is to examine the fiscal impact on the Greek economy, giving emphasis on the inflationary, crowding out and balance of payments implications of the fiscal deficit.

We start our study in chapter one by analysing the means through which the fiscal impact can be examined. First we describe the traditional measures of fiscal stance along with their virtues and drawbacks. In the second chapter the new approach to fiscal stance with its explicit connotations on potentially current and future inflationary and crowding out pressures is described.

Chapter three summarises the structural characteristics of the Greek monetary system, in particular the legal reserve requirements of the commercial banks.

The fourth chapter analyses the difficulties in applying the measures of fiscal stance in developing countries and states the necessary alterations to the measures in order to capture the structural characteristics of this group of countries. Three measures are estimated in order to examine the fiscal stance for Greece. The measures employed differ in the assumptions they postulate as far as the neutrality of the budgetary policies is concerned and their short medium and long-run growth perspectives.

In chapter five the private investment behaviour and its relations with the government investment expenditures is examined. The model that was constructed



was consistent with the underlying mechanisms of the financial repressed economies. The interrelations of private investment and their financing via the banking system, inflation and government investment are explicitly postulated in the context of the estimation of an econometric model.

In chapter six we examine the effects of the fiscal deficit on the economy via its effects on the output, balance of payments and inflation using different econometric models which are consistent with the stabilization instruments in newly industrialized countries. The models are formulated in such a way as to capture the new developments in the international economic environment after the first oil crisis, the abolition of fixed exchange rates and the slower growth rate of the industrialized countries. Furthermore, the short-run disequilibria in the domestic economy and foreign sector are examined as well.

Finally, we examine output and price behaviour under the assumption of rationally formed expectations.

The study covers the short-run and long-run implications of the budgetary policies in Greece and tries to examine their impact in the economy in the context of the implementation of stabilization policies. The long-run effects of the fiscal deficit are examined through their impact on investment and inflation and the influence the latter exerts on the former. To examine these long-run relationships we chose the period 1953-81, while for the summary measures of fiscal stance the period 1960-83 was regarded as the appropriate one.

The latter period was chosen because the year 1960 is considered as the base year for the construction of the summary measures and because the problem of the fiscal deficit became important after the first oil crisis. Thus choosing a year beyond 1960 could be very unrealistic. Furthermore, the interest payments of the the fiscal debt were a trivial amount in the fiscal budget, before 1960. As far as the investment model is concerned we do not include the years 1982 and 1983 because of the change in the institutional and political climate of the country, after 1981, which had direct implications on private investment behaviour.

For the short-run implications of the fiscal deficit the period 1975-83 was chosen, using quarterly data, in contrast to the annual data for the period 1953-81. The lack of disaggregate data for the various categories of the government expenditure and revenues urges us to use different approaches to examine the effectiveness of stabilization policies, working through the fiscal and monetary policies of the government.

The use of two different sets of data, that is annual for the 1953-81 period and quarterly for the 1975-1983, as well as the two different time periods rests on the following reasons. Quarterly data for a limited group of macroeconomic variables exists since the first quarter of 1975. Furthermore, since the need for the implementation of stabilization policies emerged after 1975 the examination of the 1975-83 time period is thoroughly justified. Using annual data to examine these stabilization prospects of the economy creates the

problem of capturing the structural changes that took place after 1975 in the international environment that is the abolition of fixed exchange rates. This problem is further intensified if, as in our case, we are interested in the implications of fiscal policies on the balance of payments and the domestic economy as well.



## CHAPTER I

Measures of Fiscal StanceA) Introduction

A measure of fiscal policy (not necessarily a single number) is required for several reasons :

a) Historical appraisal of past policy actions.

Summary measures help to examine (i) the actions taken by the stabilization authorities (ii) the reasons for their success or failure, (iii) whether these actions were expansionary (and by how much) or contractionary (and by how much) and (iv) when they were neutral in their aggregate effects.

b) Policy planning.

Since the policy planning is more than an "expand versus contract" exercise, a specific set of indicators of fiscal policy is imperative. This will enable economists to prescribe the right dosage of fiscal stimulus.

c) Reduced form studies.

The reduced form approach to income determination and prediction obviates the need to specify a detailed structural model of the economy. The reduced form equation for the variables of interest is estimated by the list of the exogenous variables in the (unspecified) model. It is, thus, very likely to have some indicators of fiscal policy among the exogenous variables. This stresses the importance of specifying adequately these indicators.

d) Reaction functions studies.

Reaction functions studies of the authorities aim to describe the behaviour of policy makers. In these studies, given the fact of the different instruments of policies, it is appropriate to construct an overall measure of fiscal policy instead of explaining the behaviour of different government parameters separately.

As has been already mentioned, the above univesally accepted reasons for the need of a fiscal measure do not imply a single figure as an indicator of fiscal stance. It is possible to describe fiscal policy by constructing a detailed macroeconomic model which includes the various components of the budget. The different government expenditures and tax laws which represent the parameters of fiscal policy can, then, be manipulated to examine the effects that different combined settings of them have on target variables. This procedure is quite common to economists and researchers. However, the public seems to need a summary measure, traditionally a budget balance, of fiscal policy and to use it as a target. This means that even in the absence of an official accepted measure of fiscal policy the public will use one, and this is the government budget balance.

Moreover, the interest in the financial sector of the economy has led to the inclusion of the budget in most macroeconomic models. The plausibility and the forecasting ability of the model is connected with the plausibility of the relationship between the financial balances of different sectors. Under this concept the balance in the budget is used as a summary measure of fiscal policy changes.

Finally, the relationship between fiscal and monetary policy can be made precise by using measures of fiscal and monetary policy. Measurable concepts tend to be more useful than non-measurable.

B) The traditional measures of fiscal stance.

We can distinguish between two distinct families of measures :

a) A budget measure which summarises the congeries of taxation and expenditure programmes in a single figure. It is mute on the effects of the program on GNP and it is independent of any particular model of the economy. The fact that it is the economy and not the budget that we are interested in, is the virtue and vice of this kind of measure.

b) A fiscal impact measure which is derived from a suitable budget measure by applying to the latter some appropriate multiplier. This approach makes a single figure, which measures the effect of the total budget on any variable of interest, to rely on the existence or the construction of a specific model of the economy.

The inadequacy of the actual budget deficit (or surplus) as a measurement of fiscal stance stems from the fact that it is endogenous to the economic system. This means that it cannot exert an independent impact upon economic activity. It must be purged of its endogenous components in order to serve as a measure of fiscal policy. An additional drawback is the fact that it does not weight the different impacts of government spending and taxes changes on the level of income. The



conclusion is that if it is used as a target it may induce perverse actions.

### 1) The Full Employment Surplus (FES)

The FES is the most popular alternative to the actual budget as a measure of fiscal stance. It separates the discretionary from automatic fiscal actions. The alleged superiority of FES to the actual budget balance is reduced if we consider the following drawbacks of it:

#### a) Weighting

The FES does not take into account the doctrine of the balanced budget multiplier (an increase in government spending upon goods and services is more expansionary than an equal reduction in taxation or an equal increase in transfer payments). To remedy this failure the concept of the weighted full employment budget surplus (WFES) has been used. The differential strength of taxes versus government expenditure translated into different weights to expenditure and taxes are thus recognised by the WFES. It has been argued that over short periods of time the use of an elaborate weighting system is justified only in the case of large shifts in the structure of expenditures. However, even if the composition of expenditures does not change much, an unweighted budget deficit may indicate the direction of the effects of fiscal policy but not the right magnitude of fiscal policy effects.

#### b) Tax mix

It has been argued that indirect taxes exert a greater deflationary impact than equal yielding direct

taxes. Peston (1971) showed that in multitax world which includes sale and direct taxes a change in the total tax mix in favour of direct taxes, with total tax proceeds held constant, would exert an expansionary impact upon the level of economic activity. To this we should add the differential impacts on interest rates and investment, originating from the increased (decreased) indirect taxation which increases (reduces) the prices and consequently the interest rates (assuming unchanged money stock). Moreover, prices may have an adverse impact on consumption expenditures. All these considerations make the need to attach different weights to different tax components apparent when the WFES is used.

#### c) Balance of payments

Changes in the full employment budget may have different impacts for the balance of payments (e.g. the marginal propensity to import of the public sector may differ from that of the private sector). This means that changes in taxes and/or expenditures will have different consequences for the balance of payments. In addition, changes in corporate taxation may have a different impact on imports from those arising from changes in personal taxation. These influences should be taken into account when the weights of the fiscal change are to be considered.

#### d) Actual impact

Changes in tax laws may involve a net revenue loss at a low level of resource utilization but would yield a net revenue gain at full employment (e.g. at low levels of business activity a small reduction in personal inco-

me tax rates will generate a net loss of revenue while at high employment levels the opposite may occur). The concept underlined above means that the FES can give accurate estimates of the actual fiscal impact in cases of parametric shifts of the budget functions only. This implies that the true size of discretionary fiscal actions will depend on the level of economic activity in the case of a change in the slope of the budget function.

It should be added also that in advanced economies the progressiveness of taxation of labour and capital income differs. As income distribution varies during the course of the trade cycle the above distinction makes the change in the FES and WFES no longer an adequate measure of the actual change when other stages in the cycle are considered.

#### e) Fiscal drag

A growing economy with unchanged tax laws will experience ever increasing tax receipts at full employment (or for that matter at any other constant level of utilization). This automatic increase in the FES obviates the great virtue of the FES, that is the ability to distinguish between discretionary and automatic fiscal changes. The FES will indicate an expansionary fiscal intervention, since revenues reveal greater responsiveness to income changes than outlays do. In periods of rapid price increases (especially when actual prices increase more than their trend value) the concept of the FES can become bedevilled. This happens because we have to calculate the full employment output before the implications of government policies can be assessed. To



calculate the money full employment output we must apply a suitable price level which involves the task of calculating a rate of price increase adjusted for inflation. This adjustment implies the use of arbitrary chosen rules of thumb. The concept of fiscal drag is that the automatic rise in revenues siphons too much of the economic substance out of the private economy and thereby slackening expansion. It must be mentioned that some automatic increase in the full employment surplus may be desirable if autonomous expenditures are rising. This must be considered when we have to adjust FES for the fiscal drag.

f) Lags in responses.

In the FES concept there is no consideration of lags. Budgetary measures taken at time  $t_0$  may impinge on the economy at time  $t_1$ . Thus, if at  $t_1$  the economy is experiencing underutilized resources, this does not necessarily imply that the correct response should be a decrease in the full employment surplus, because the economy may still be responding to budgetary measures undertaken at time  $t_0$ .

g) Other Problems

Problems arise from the fact that the domestic impact of any fiscal change will be different under different exchange rates regimes. Also, the FES is a poor measure of fiscal policies when comparisons between countries are to be made, partly because the potency of the automatic stabilizers that discretionary policy has to overcome will differ between countries.

The FES is relevant to policy evaluation only when the policy objective is the full employment of the economy. Thus, it is meaningless when inflationary conditions and adverse balance of payments problems exist and remove the emphasis from the full employment target towards the reduction in price increases and current account deficits or sustainable growth rates.

## 2) Fiscal leverage (FL)

The concept of fiscal leverage was proposed by Musgrave (1964) as a measure which reflects fiscal impact and assesses the cyclical role of fiscal intervention. FL is given by

$$FL = \sum w_i G_i - \sum \mu_i T_i \quad (1)$$

where  $G_1 \dots G_N$  and  $T_1 \dots T_M$  are different types of expenditure and revenues and  $w_i$ , and  $\mu_i$  are multipliers suggested by some model. Since a purer measure of the change in fiscal policy would be obtained by calculating fiscal leverage at some fixed level of income, if we choose the full employment income we have calculated the Weighted Full Employment (WFE) deficit multiplied by some appropriate multiplier. Given the fact that multipliers are hard to know with precision (unless a detailed macroeconomic model is formulated) dispensing with the multiplier we are, then, left with the negative of WFES. In assessing the merits of FL we must consider the following:

a) FL estimates the impact of fiscal policy change upon the level of demand (and implicitly employment). It ignores alternative objectives.



b) FL depends on the econometric model and the estimation procedure adopted in determining the values of the coefficients used.

c) FL includes both discretionary and automatic changes in the budget.

### 3) Fiscal performance measures

B. Hansen (1968) attempted to obtain a direct appraisal of the contribution of fiscal policy to stabilizing the level of income and promoting a desirable income level. He tried to construct the pure cycle GNP, that is the hypothetical progress of the economy in the absence of budgetary measures. When the actual GNP data fall closer to the trend rate of GNP than the pure cycle rate, then the budget may be considered stabilizing and vice versa. Since the stabilizing authorities have a target growth path of GNP (desirable or potential full employment GNP), we need stabilization around this growth path of GNP. Thus, a better measure could be to measure the reduction in the GNP gap caused by fiscal measures that otherwise would have prevailed in the absence of fiscal policy.

The main objections to this kind of measures is that the policy is evaluated in terms of output volume (which serves as a proxy for employment objectives). This implies that their validity is questionable unless we are prepared to accept that the different policy objectives are complementary to each other and do not conflict.

### 4) Weighted standardized surplus (WSS)

The shortcomings of the above mentioned measures of

fiscal policy can be overcome by evaluating the standardized surplus (SS). The underlying notion of this measure is that comparisons of alternative budget structures ought to be carried out using actual rather than full-employment income as a base. It aims to isolate those changes in the budget which are induced by changes in income from those which reflect shifts of exogenous policy parameters. This is equivalent to quantifying changes in tax rates and/or transfer payments in terms of revenue and expenditure impacts on the initial level of income. This measure can be rigorously established for a broad class of aggregate models. It is only necessary to multiply the change in each fiscal instrument by the ratio of its own multiplier to the basic expenditure multiplier and sum the multiplied products.

#### 5) A Mathematical Exposition of the FES and WSS

##### a) WSS

The different measures of fiscal policy can be represented in the context of the following model of income determination.

$$Y_t = C_t + I_t + G_t \quad (2)$$

$$C_t = c_t [ (Y_t - T_t), at ] \quad (3)$$

$$T_t = T(Y_t, r_t) \quad (4)$$

$$I_t = I(\beta_t) \quad (5)$$

where :

- C = private consumption,
- I = private investment,
- T = government revenue,
- G = government expenditure,
- r = tax rate,
- t = time,

and  $a_t, \beta_t$  = represent the other factors affecting consumption and investment.

The IS current income determinant equation is:

$$Y_t = c ([Y_t - T(Y_t, r_t)], a_t) + I(\beta_t) + G_t \quad (6)$$

Differentiating totally and solving for  $dY$  we obtain :

$$dY_t = \{ [dG_t - c_y T_{r,t}(Y_t, r_t) dr_t] / (1 - c_y (1 - T_y)) \} + \{ (c_a da_t + I_\beta d\beta_t) / (1 - c_y (1 - T_y)) \} \quad (7).$$

The first bracketed term of (7) is simply the negative of the change in the weighted standardized surplus (WSS) multiplied by the government expenditure multiplier  $[1 - c_y (1 - T_y)]$ . This term measures the discretionary effect of government stabilization policy while

$$dY = [ (dI + c_a da_t) / (1 - c_y) ] \quad (8),$$

measures the total effect of government policy. So the automatic stabilizing effect of the tax structure is:

$$\begin{aligned} \text{auto} &= [ c_y T_y (dI_t + c_a da_t) ] / [1 - c_y (1 - T_y)] = \\ &= [(dI_t + c_a da_t) / (1 - c_y)] \\ &- [(dI_t + c_a da_t) / (1 - c_y (1 - T_y))] \quad (9). \end{aligned}$$

Thus, we can construct hypothetical growth paths for a country in the absence of

a) any discretionary action

$$dG_t - c_y T_{r,t}(Y_t, r_t) dr_t / [1 - c_y (1 - T_y)] = 0 \quad (10),$$

and b) automatic stabilizers  $\text{auto} = 0$ .

Consequently we can measure the percentage of the business cycle that was eliminated by discretionary and automatic fiscal actions.

b) FES

If  $R_t = T(Y_t, r_t) - G_t$  stands for actual budget surplus, a measure of fiscal influence would be



$$dR_t = T_y dY_t + T_{r,t} dr_t - dG_t \quad (11).$$

The term  $T_y dY_t$  is endogenous, which means that  $dR$  and  $T_y dY_t$  are jointly dependent and can not exert an independent influence on one another.

The change in FES is given by:

$$d(\text{FES}) = T_{r,t} (Y_t^p, r_t) dr_t - dG_t \quad (12).$$

There is no feedback term in  $dY$ . Comparing (12) with (7) we see that FES (i) fails to weight the change in taxes by the marginal propensity to consume and (ii) it computes the revenue yield of changes in taxes at potential GNP ( $Y_t^p$ ) rather than actual GNP. That is, any change in  $r_t$  and  $G_t$  which satisfies  $dG_t = c_y T_{r,t} (Y_t, r_t) dr_t$  will leave  $Y_t$  unchanged by (7) but will alter FES by (12). On the other hand, any change in fiscal policy which satisfies  $dG_t = T_{r,t} (Y_t^p, r_t) dr_t$  will have no effect on the FES but will change the  $Y_t$  by (7).

The first shortcoming can be overcome by using the weighted full employment surplus:

$$\text{WFES} = c_y T(Y_t^p, r_t) - G_t \quad (13).$$

If  $d(\text{WFES}) = c_y T_{r,t} (Y_t^p, r_t) dr_t - dG_t > 0$ , and from (7)  $dY_t$  is also greater than zero, we have the following inequality:

$$c_y T_{r,t} (Y_t, r_t) dr_t < dG_t < c_y T_{r,t} (Y_t^p, r_t) dr_t \quad (14).$$

This inequality implies that under certain conditions (certain policies mixes) we have  $dY > 0$  and  $d(\text{WFES}) > 0$  or  $d(\text{FES}) > 0$ . This renders the FES or WFES an inadequate measure for ranking alternative budget structures, since an increase in FES or WFES which must be contractive can lead to an increase in  $Y$ . The inequality indicates that the closer the income is to its full employment level,

the less likely the WFES is to yield incorrect conclusions, regarding the direction of fiscal policy.

c) The concept of fiscal drag (FD)

Expression (15), below, of  $d(\text{FES})$  represents the change in FES corrected by autonomous increases in  $Y_t^p$  ( $T_y(Y_t^p, r_t) dY_t^p$ ). The change in FES,  $d\text{FES}$ , when allowing for  $Y_t^p$  to grow automatically over time is given by:

$d(\text{FES}) = T_{r,t}(Y_t^p, r_t) dr_t - \Delta G_t + T_y(Y_t^p, r_t) dY_t^p$ . The fiscal drag is  $T_y(Y_t^p, r_t) dY_t^p$ . Since part of the automatic growth of  $Y_t^p$  is desirable in order to maintain full employment,  $r_t$  would have to be constantly manipulated to satisfy

$$Y_t^p = c[Y_t^p - T(Y_t^p, r_t)] + I(\beta_t) + G_t \quad (15),$$

or

$$dY_t^p = c_y dY_t^p - c_y T_y dY_t^p - c_y T_{r,t} dr_t + dG_t + dI_t \quad (16),$$

and, therefore,

$$T_{r,t} dr_t = \{[-(1-c_y(1-T_y))/c_y]\} dY_t^p + [dI_t + dG_t]/(c_y) \quad (17)$$

represents the change in  $dr_t$  required to maintain full employment. Defining the adjusted fiscal drag (AFD) as the difference between  $T_y dY_t^p$  and the total tax increase that would be needed to preserve full employment, i.e.

$\text{AFD} = (T_{r,t} dr_t + T_y dY_t^p)$ , we have

$$d(\text{FES}) = T_{r,t}(Y_t^p, r_t) dr_t - dG_t + T_y dY_t^p - (T_{r,t} dr_t + T_y dY_t^p) \quad (18).$$

It is clear from the expression that the AFD is the negative  $T_{r,t} dr_t$  (the discretionary change in full employment taxes needed to maintain full employment). There is no fiscal drag, if the increase in the full employment GNP ( $dY^p$ ) equals the increase in capacity that is required to meet the autonomous growth of demand, which is  $(dI_t + dG_t)/[1-c_y(1-T_y)]$ .

Since FD may be attributed to inflation and real

growth, the real change in FES is given by:

$$d(\text{FES}) = [f_1 Y_t^p - f(P)] dP_t / P_t + f_1 dY_t^p + (f_2 / P) dr_t - dG_t \quad (19),$$

given that

$$\text{FES} = [f(P_t, Y_t^p, r_t) / P_t] - G_t, \quad (20a) \text{ and}$$

$$PT = f(P_t, Y_t^p, r_t) \quad (20b), \text{ where } P \text{ is the price}$$

level, and  $f_i$  ( $i=1,2,\dots$ ) indicates partial derivative. The first two terms of (19) represent the FD due to inflation and real growth, respectively. If the tax function is progressive (i.e.  $f_1 PY > PT$ ) inflation contributes to fiscal drag.

The AFD can also be refined to take into account the automatic stabilizing effect of inflation:

$$Y_t^p = c[Y_t^p - (1/P_t) f(Y_t^p, P_t, r_t) + I_t + G_t] \quad (21),$$

$$dY_t^p = c_y dY_t^p - (c_y / P_t) f_1 Y_t^p dP_t - (c_y / P_t) f_1 P_t dY_t^p + (c_y / P_t^2) f_1 P_t^2 dY_t^p - (c_y / P_t) f_2 dr_t + dI_t + dG_t \quad (22).$$

The required discretionary tax change in real terms

$$\text{AFD} = (-f_2 dr_t / P_t) = [1 - c_y (1 - f_1) / c_y] dY_t^p + f_1 PY_t^p dP_t / P_t - [(dI_t + dG_t) / c_y] \quad (23).$$

Since, as has been shown, the WSS is superior to the other measures of fiscal stance we proceed to the analysis of the main problems of constructing it (disregarding the familiar problem of choosing a macroeconomic model).

#### d) Problems of constructing the WSS

1) Given that most econometric models are non-linear, the partial derivatives in an expression like (7) will be through time a function of the initial conditions. The most important non-linearity emerges from the degree of resource utilization and its bearing on how



any increase in aggregate demand is apportioned between increases in real output and increase in prices. This non-linearity accounts for the different multipliers. This variability of the multipliers makes any measurement of fiscal policy based on constant multipliers useless. To remedy this we must compute different multipliers each period for every instrument by simulating the model for each of the policy instruments from each of the starting points in the sample period. This procedure involves high computational costs.

2) The second problem arises from the existence of lags in all econometric models. This means that we must compute first-period multiplier, second period and so on for each policy instrument. What is clear from this consideration is the need to choose a relevant time dimension; here an additional problem emerges, since there is no single correct answer. The safest way is to compute a variety of measures based on different time horizons. Then we can use the measure according to the use to which it is to be put (e.g. in specifying a dependent variable for a reaction function, the time horizon of the policy measure ought to be the presumed planning horizon of the policy maker).

3) A further problem is created by the presence of lags. Suppose  $F_y^4(t)$  measures the influence on GNP in quarter  $t+3$  of the fiscal actions taken in quarter  $t$ . Considering the lagged effects of policies taken last quarter, two quarters and so on, the total impact of all fiscal policies executed through period  $t$  would be  $F_y^4(t) + F_y^5(t-1) + F_y^6(t-2) + \dots$ . Since it is difficult to

calculate this infinite series we can simplify the problem by choosing to estimate only, for example, fourth and eighth quarter multipliers. We can compute then  $K_y^4(t)$ ,  $K_y^8(t)$ , the impact on GNP in quarter  $t+3$ ,  $t+7$ , respectively, of all fiscal policies executed prior to quarter  $t+3$ ,  $t+7$ , less those effects already felt by quarter  $t+3$ ,  $t+7$ . If we have a model of  $h$   $[I_j(t), j=1,2,...h]$  policy instruments, the  $n$ th quarter multiplier for instrument  $j$  can be denoted by  $m_j^n$  when  $n=4,8$ . We can calculate, then, the two measures of fiscal influence on real GNP by using the following two expressions :

$$F_y^4(t) = \sum m_j^4(t) \Delta I_j(t), \quad F_y^8 = \sum m_j^8(t) \Delta I_j(t) \quad (24).$$

Finally the total influence on real GNP of past and current policies over the four and the eight period horizon denoted by  $T_y^4(t)$  and  $T_y^8(t)$  respectively are obtained by

$$T_y^4 = F_y^4 + K_y^4, \quad T_y^8 = F_y^8 + K_y^8 \quad (25).$$

Using this procedure we can have indicators of the stance of fiscal policy, depending on the time dimension of the multipliers employed. It would be useful to see how these two measures correspond to each other and whether or not the sign patterns coincide. It must be mentioned here that discrepancies may arise because the economy responds with a different distributed lag to each fiscal instrument. Some policy mixes are expansionary over a one quarter horizon but contractionary over an eight quarter horizon.

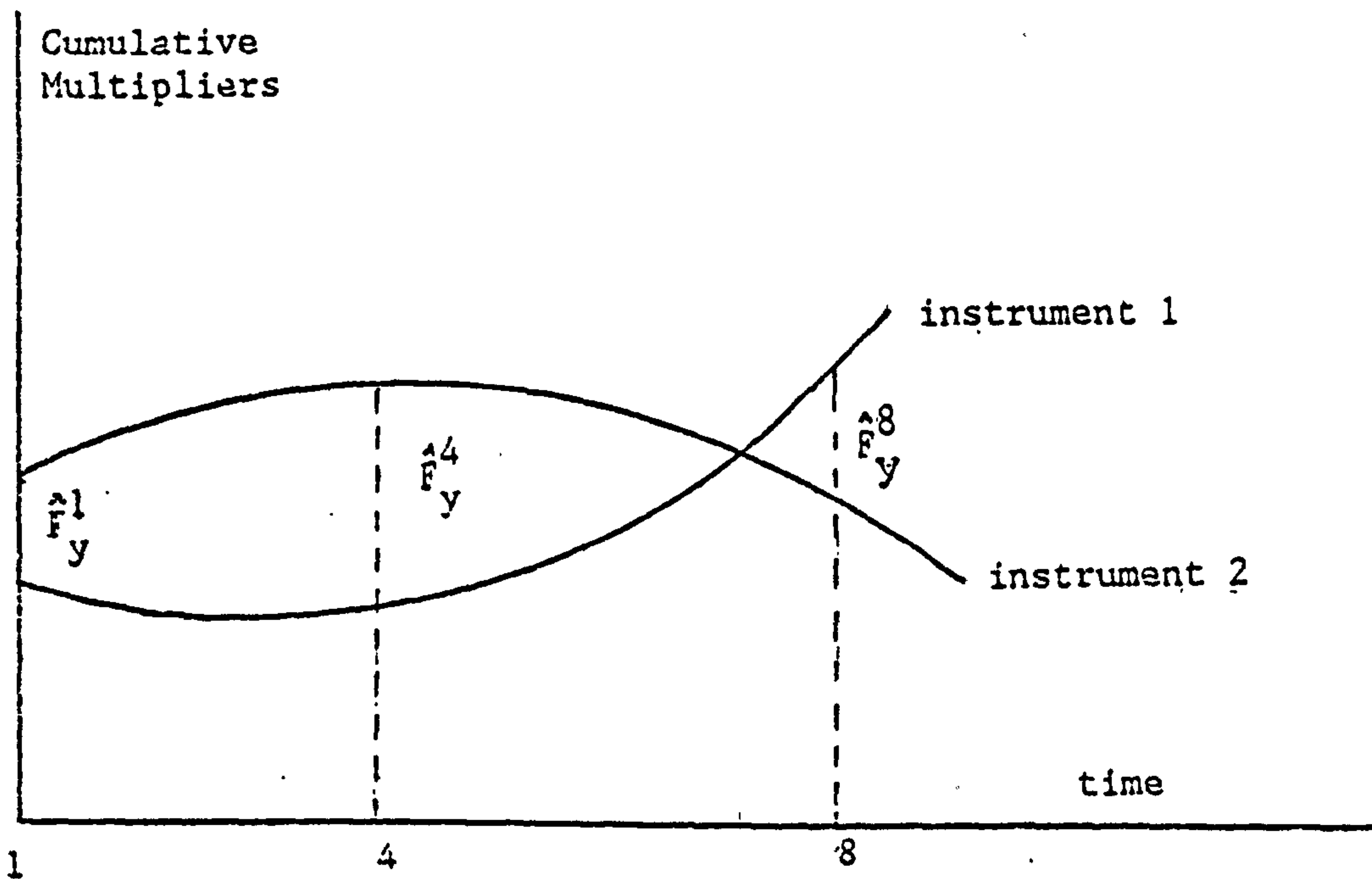
Figure I-1 illustrates the hypothetical dynamic (cumulative) multipliers of an economy with two fiscal intru-



ments, where instrument 1 is increased and 2 decreased by the same amount,  $\hat{F}_y^1$ ,  $\hat{F}_y^4$  being positive, while  $\hat{F}_y^8$  is negative.

Figure I-1

Dynamic multipliers



We can extend our analysis to include measures of fiscal impact on other macroeconomic targets such as prices, interest rates, and the balance of payments. One interesting use to which these measures of fiscal influence can be put is to shed some light on the implicit trade-offs in specific models.

We can proceed by showing how it is possible to use the measures already suggested to estimate a simple reaction function and a reduced form equation. We suppose the government wish to make some contribution to the normal growth of aggregate demand and to apportion  $\hat{F}_y^4$ ,  $\hat{F}_y^8$  to current gap between potential and actual GNP. The reaction functions are represented by the following

relations :

$$F_y^4 = \hat{F}_y^4 + \lambda_4 (Y_t^p - Y_t) + u1_t \quad (26),$$

$$\text{and } F_y^8 = \hat{F}_y^8 + \lambda_8 (Y_t^p - Y_t) + u2_t \quad (27),$$

where  $0 \leq \lambda_4 < 1$ ,  $0 \leq \lambda_8 < 1$

$Y_t^p$  = potential GNP

$\hat{F}_y^4, \hat{F}_y^8$  = normal contribution of fiscal action to steady growth.

Moreover, we assume that  $\hat{F}_y^4, \hat{F}_y^8$  are linear functions of the increase in potential GNP:

$$\hat{F}_y^4 = a_4 + \beta_4 (Y_{t+3}^p - Y_t^p), \quad \beta_4 > 0 \quad (28)$$

$$\hat{F}_y^8 = a_8 + \beta_8 (Y_{t+7}^p - Y_t^p), \quad \beta_8 > 0 \quad (29)$$

$$Y_{t+3}^p = (1 + \gamma_4) Y_t^p, \quad \gamma_4 > 0 \quad (30)$$

$$Y_{t+7}^p = (1 + \gamma_8) Y_t^p, \quad \gamma_8 > 0 \quad (31)$$

Consequently (26) and (27) change to

$$F_y^4 = a_4 + (\lambda_4 + \beta_4 \gamma_4) Y_t^p - \lambda_4 Y_t + u1_t \quad (26a)$$

$$F_y^8 = a_8 + (\lambda_8 + \beta_8 \gamma_8) Y_t^p - \lambda_8 Y_t + u2_t \quad (27a)$$

It is clear that this procedure suggests regression of  $F_y^4, F_y^8$  on potential and actual GNP. If the reaction functions are stabilizing, the coefficient of the former should be positive while the coefficient of the latter should be negative and algebraically smaller. It should, also, be expected  $\lambda_8 > \lambda_4$  (more of the gap is filled over an eight-quarter than over a four-quarter horizon). A restriction of the model is that we expect the constants to be approximately zero. If we know the values of  $\gamma_4, \gamma_8$  by extraneous information all parameters are identified. Similarly the following relations show how the suggested measures apply to the reduced form of equation for GNP.

A typical form of this equation could be

$$\Delta Y_t = b + \sum w_i \Delta M_{t-i} + \sum w_i \Delta F_{t-i} \quad (32),$$

where  $\Delta M$ ,  $\Delta F$  are measures of monetary and fiscal influence. Using the already suggested measures of fiscal policy and a similar measure for monetary policy we can get :  $\Delta Y_t = b + b_1 S'y(t) + b_2 T'y(t)$  where  $S'y(t)$  and  $T'y(t)$  are the corresponding measures for fiscal and monetary policy. In addition,  $b_1$ ,  $b_2$  are expected to be close to unity. A close inspection of the reduced equation reveals that, a) it has no lagged variable because  $S'y$  and  $T'y$  include all past effects, and b) it allows for variable multipliers.

The foregoing discussion stresses the fact that when the estimation of the impact of fiscal policy is being exercised a clear distinction must be made between "full employment (or fiscal impact adequacy or secular adequacy) measures" and "cyclical effects indicators". The full employment surplus has been used as a rough indicator of the cyclical impact of fiscal policy, but as it is estimated reveals that it is adequate for medium term policy. As J. Lotz (1971) has pointed out, a cyclical measure of fiscal policy should a) distinguish between discretionary and autonomous budgetary changes, b) weight the changes in some budget items, and c) make it possible to estimate the time profile of the effects on demand of changes in fiscal policy. The FES cannot satisfy these requirements.

However, the significance of the adequacy of the full employment measures lies in the supplementary information they provide :



a) In some countries where public resistance to deficit spending is strong, it may be useful to show that at high employment a given budget program would yield a surplus.

b) An estimate of the high employment surplus can provide measures of different levels of fiscal drag at different levels of economic activity. Since these fiscal drags can constitute an important obstacle to the attainment of a desired level of activity, FES estimates can assist towards the avoidance of this activity restraints of budget policy changes.

c) FES is the excess of private investment over private saving required to achieve equilibrium at full employment. This focuses attention on the growth in the public sector and may help to clarify the extent to which, in the longer run, increases in tax rates may be needed to finance higher spending.

The simultaneous use of both kind of measures (full employment and cyclical) may contribute to a fiscal policy which could ensure a reasonable adequate long-term growth of demand without completely sacrificing short-term adaptability.

If it is believed that economic forecasting is inadequate to serve as a guide for the fine tuning of the economy, perhaps because the lags in the effects are considered to be long and not well understood or because the consumption patterns are not stable we should choose a measure like the full employment surplus. If, on the other hand, emphasis is placed on an active and flexible fiscal policy we will opt for the cyclical measure.

To complete the discussion on the summary measures of fiscal stance three more national measures should be mentioned.

### 6) The German measure

This measure tries to capture an annually neutral budget balance, while, at the same time, takes into account the effects of economic activity into the budget. The cyclically neutral budget (CNB) is given by the expression

$$\text{CNB} = g_0 Y_t^p - t_0 Y_t \quad (1),$$

where  $t_0$  represents the base year ratio of revenue to actual GNP, and  $g_0$  stands for the base year ratio of expenditure to potential GNP. The main concept underlying this measure is that a year exists during which all major targets of the economy such as employment, inflation, balance of payments are at satisfactory levels. This year is defined as the base year. Neutral fiscal policy is defined as the one where the neutral government expenditure grows from its base-year level at the same rate as potential output and the (neutral) revenues vary equiproportionately with actual GNP.

Increases in government expenditure in excess of  $g_0 Y_t^p$  are considered neutral if they are accompanied by certain types of tax increases. Furthermore, revenues increases due to progression effects caused by cyclical variations in income do not justify extra expenditure increases. However, in the medium run, if there is a deviation from the tax share of GNP in the base year this must be accompanied by increased expenditure. If the actual budget balance in year  $t$  is greater than the neutral budget, the budget is expansionary, while the opposite happens if actual budget is smaller than the



neutral one. Using this measure we can examine whether an expansionary (contractionary) budget is countercyclical or not by taking into account the situation of the economy. If the economy is in a recession the cyclically neutral deficit balance will be greater than its base year. Thus if  $CEB = (G_a - T_a) - CNB > 0$ , where  $(G_a - T_a)$  denotes the actual deficit, then the actual budget is countercyclical.

### 7) The Dutch Budget Impulse

This measure allows us to consider longer-run equilibrium and cyclical effects separately. The approach to assessing medium-term budget uses as its norm a budget deficit that is adapted to the medium-term development of savings and investment in the economy (this notion corresponds to Germany's secular norm, the base year balance).

The impulse of the budget BI is given by :

$$\begin{aligned} BI &= [G_t - T_t - (G_{t-1} - T_{t-1} - yT_{t-1})] / G_{t-1} \\ &= ((G_t - G_{t-1}) - [(T_t - (1+y)T_{t-1})]) / G_{t-1} \end{aligned} \quad (2).$$

If revenue in the current period equals the amount that would have resulted if the previous year's revenue had grown at the same rate as current GNP ( $y$ ), BI measures the rate of growth of government expenditure. If revenue grows faster than current GNP, the excess over the proportionate increase is deducted from government expenditure because it offsets expenditures contribution to aggregate demand. In other words, BI is the effective rate of growth of government expenditure which is compared with the potential output growth rate

$y^p$  to measure the cyclical effect of the budget, i.e.  $DCEB = BI - y^p$ ; if  $DCEB > 0$  the budget has an expansionary effect, while the opposite holds if  $DCEB < 0$ . When the two growth rates coincide the budget is characterized as neutral. The concept of neutrality is defined as that growth rate of the contribution of the budget to aggregate demand which is the same as the growth of potential output. This implies that the budget is not a source of any imbalances between increments in aggregate demand and supply.

#### 8) The Swedish approach.

The Swedish approach measures the effects of fiscal policy on total demand and not only on the level of GNP. Total demand is defined as the demand for imports plus the demand for domestic production (GNP).

The budget is separated into two main parts. The first part is made up by the changes in government consumption and investment expenditures. Since these changes correspond to direct demand increases for real resources they are assigned a multiplier effect of unity in order to determine budget impact on total demand. The second part includes changes in the level of financial saving of the consolidated public sector (changes in the budget balance exclusive of net lending, arising from changes in direct government expenditure and transfers on the one hand, and in government tax receipts on the other hand). A change in financial saving will result in an equal but opposite change in the level of total demand. This simply implies that a balanced budget increase is



assigned a multiplier of unity to determine budget effects on total demand. In addition, an increase in expenditure with unchanged tax revenues is assigned a multiplier of two, whereas an increase in tax revenues with unchanged expenditures is assigned a multiplier of -1.

This approach can be depicted by the following expressions :

$$\Delta K = \Delta K_1 + \Delta K_2 \quad (3),$$

where  $\Delta K$  is the change in total demand induced by changes in the consolidated public sector budget,  $\Delta K_1$  is the change in total demand arising from direct government expenditure, and  $\Delta K_2$  stands for the change in total demand arising from changes in the level of financial saving. So we have  $\Delta K_1 = \Delta G$ ,  $\Delta K_2 = -\Delta FS$ ,  $\Delta FS = \Delta T - (\Delta G + \Delta E)$ , where  $\Delta E$  is the change in transfer expenditures. Thus, we have

$$\Delta K = 2\Delta G - \Delta T + \Delta E \quad (4).$$

Although the two former measures are going to be discussed analytically in another chapter, we mention here that all of them are subject to the same drawbacks as the FES. The only exception is the Dutch approach which allows for the fiscal drag to be deducted from the budget impulse.

#### 9) The recording of transactions

To evaluate the fiscal impact on the economy, government transactions should be recorded at the time they affect economic activity. In most national accounts government budgets are represented by transactions recorded at the time of transaction (accrual basis)

rather than at the time of the actual cash payments (cash basis). The preference of the accrual basis rests on the argument that the economic decisions in the private sector resulting from transactions with the public sector occur from the time of these transactions rather than from the time of corresponding cash payments. This can be seen clearly from the following example. We assume that government revenues have been increased by a speeding up of the collection of corporate income taxes; such increases in revenues should not be interpreted to mean a stricter fiscal policy, because with no change in the amount to be ultimately paid, the response of corporations to the tax may not change. However, to this argument we can add that the cash transactions also have an effect, since it may change the liquidity of corporations. A budget representation which includes the accrual based budget and its cash deficit with its financing as well, could be an adequate starting point for the construction of the summary measure of fiscal stance.

### C) The monetary sector

The main reason for considering the effects of different methods of financing the deficit when we are interested in finding a measurement of fiscal stance is the crowding out issue. The existence of real constraints on the expansion of real output in the economy gives rise to the occurrence of the crowding out effect. According to the monetarists the implications of these constraints are higher rates of inflation which accomp-



any the short-run expansionary effects of fiscal policy. A different result is expected by those who believe in the bargaining view of wage determination, increasing returns to scale in production, and embodied progress. According to this view, higher levels of capacity and labour utilization follow the fiscal expansion with a higher growth path in the longer run.

Crowding out can also occur through the wealth effects of the fiscal changes (resulting from financing the fiscal deficit and any induced price increases). Disregarding the issue of the appropriate definition of monetary and fiscal policy and assuming that changes in the costs of servicing government debt are offset by changes in other government transfers to the private sector, we can summarize the consequences of the way of financing the deficit in the economy by taking into account the wealth effects.

Starting out from the familiar IS/LM context the effectiveness of the fiscal policy depends on the relative size of the interest elasticities of the private sector expenditure and money demand functions. If the expenditure elasticity is high, a fiscal policy has little to offer as a stimulus to the economy, since the increased interest rate reduces private sector expenditure. If the interest elasticity of the money demand function is low, the rise in interest rate will be higher, reducing further the private sector expenditure.

The definition of income may have a role to play as far as the increase in interest rates is concerned. A broad definition of money makes the demand for money



more sensitive to post-tax income. Expansionary budget fiscal policy will tend to dampen the rise in interest rates because the increased tax rates will tend to reduce money demand. This factor will tend to diminish the extent of crowding out with constant monetary growth. However, this kind of analysis assumes that the private sector wishes to absorb any amounts of bonds that the government issue. This quite unrealistic assumption is cancelled by including the wealth effect in both the money demand and expenditure function. Including the wealth in the IS/LM analysis we have to face the question of what consists wealth for the private sector. This dispute over this matter is focused on the inclusion of government bonds in private sector's portfolio. We continue by assuming that government bonds count (partly) as net wealth in household portfolio. It should be mentioned at this point, that according to Pesek and Patinkin (1967), the bank demand deposits count as part of private sectors wealth. This argument may lead to quite important considerations when public deficits give rise to monetary expansion, since monetary expansion generates a multiple expansion of demand deposits.

In the discussion of wealth effects, it is important to realize the reasons for changes in net wealth. Net wealth changes because of changes a) in the quantity of assets outstanding b) in interest rates, c) in aggregate price level. In introducing wealth effects, the IS/LM analysis is modified. Suppose that all deficits are financed by printing money. An initial increase in government spending accompanied by monetary expansion

will shift the LM outward, unless the marginal propensity to demand money out of wealth exceeds unity. At the same time the IS will rise further due to wealth effects in consumption. If the budget is not balanced, more outstanding money will have to be issued and the process will be repeated. The induced rise in interest rates lowers asset prices and private sector's wealth. If the wealth effect is large on private sector expenditure the result will be a lower IS curve and thus the effectiveness of fiscal policy in short-term is diminished. If the wealth effect on money demand is large the demand for money is reduced, partly offsetting the increased demand for money due to the expansionary effects of the increased public expenditure in the goods market. The result is a lower increase in interest rates. This offsets the reduced interest-elastic expenditures and strengthens the effectiveness of fiscal policy.

The increased demand is likely to increase profit expectations through increase in capacity utilization. The result will be a rise in the value of equities. If the expansionary impact of the wealth effect in the goods market is partly offset by the contractionary impact of the wealth effect in the money market, the effectiveness of fiscal policy is increased.

Turning now to the price effects of the expansionary fiscal policy we must mention that the lower real wealth reduces the real demand for money and hence lowers the rise in interest rates. This effect must be compared with the contractionary effect of the lower real value of wealth in the expenditure function. It



must be mentioned that the reduction in the real supply of money which is unavoidable makes the effect of the price increase contractionary (in the case where prices are determined on a long-run unit costs basis, the short-run price effects are absent).

From the above it is obvious that even when we exclude the way of financing the deficit from an analysis of the impact of fiscal changes, the role of the monetary sector should not be ignored if wealth effects are present<sup>1</sup>. The analysis must also take into account the role of inflationary expectations and the way they are influenced by fiscal policy. This need arises because

a) real interest rates are decreased by a rise in inflationary expectations; however, nominal interest rates have already increased due to expansionary fiscal policy. If the final result is a decrease in real interest rates, given the fact that investment expenditures are influenced by real interest rates, the effectiveness of fiscal policy is increased, and

b) if the private sector tries to maintain the real

---

<sup>1</sup>Any Exclusion of the way of financing the fiscal deficit is based on the Ricardian debt neutrality hypothesis (Barro 1974). This Hypothesis argues that, given the level and composition of the public sector's real spending program on goods and services, the private sector is indifferent to changes in the taxation-borrowing mix that finances the above mentioned spending.



value of the monetary and non-monetary nominally denominated assets, a consequent rise in the savings ratio must be expected. The expansionary effects of the fiscal policy are reduced. By contrast the rise in this ratio will be reduced if private sector decides to run down these assets holdings to face the lower real return on the assets.

If we wish to examine the effects of fiscal policy under the concept of the wealth effects in the longer run, we have to drop the assumption of fixed prices and constant capital stock. If we choose a time horizon extremely long and we introduce a Phillips curve indicating a higher rate of inflation resulting from a higher level of demand, we have to accept that expansionary fiscal policy crowds out private expenditure on a one to one basis. Assuming money financed expansion of fiscal policy and including it into this analysis the result is quite different by ensuring the existence of higher levels of output and employment in the longer-run.

Excluding the possibility of real constraints on the expansion of output, crowding out occurs only in the case of a non-monetary expansion. If we add the influence of price expectations and reject the case of capital deepening we are again (according to the empirical results) facing a situation of non-long-run effects of fiscal policy. However, in the medium-run crowding-out occurs because of real constraints in the economy.

Considering the fact that in the long-run a fiscal expansion raises interest rates (since the increase in prices tightens money market conditions), lower output

levels will emerge as a result of capital shallowing. We have a super crowding out effect in the sense that the fiscal policy reduces both the cumulative and the long-run level of national income.

Since we are interested in measuring the effects of all the instruments of fiscal policy, we must take into account the increase in tax rates which may accompany an increase in expenditure (not necessarily an increase to satisfy a balanced budget). We have already mentioned the dampening effects of interest rate increases if we include a post-tax definition of income in our functions of both sectors. To this we should add the possibility (not empirically proved) of a lower supply of labour due to tax increases (at least we could expect them to influence adversely the participation of marginal members of the work force). However, if we assume money financed deficits, the possibility of this occurrence is reduced.

Moving away from the neoclassical concept of wage determination we come to the one based on wage bargains. These are influenced by real post-tax wages untampered by the state of labour force and prices which are determined as a mark-up on unit costs, thus, we are facing an opposite result. This analysis supports the view that the expansion of output increases the take-home pay while reducing the pressure on profit and prices. Consequently, if investment responds to higher profits, a sustained increase in output is ensured. However, a complete assesment of this policy has to compare these effects with the effects of an increased tax burden.

From the above brief analysis of the wealth effects



we can see the importance of including the way of financing the deficit into an analysis of the fiscal effects on the economy. The crowding out effects are reversed if we include the consequences of financing the deficit by issuing high-powered money.

#### 1) Bond financing

The main concern of bond financing arises from the alleged contractionary effects on the level of aggregate demand. The analysis focuses on whether the contractionary effect of new bond issues in the money market can offset the expansionary effect which operates through the wealth variable in the goods market. If the effect on the monetary sector dominates, then the fiscal stimulus will cause a reduction in the level of output which will generate lower tax revenues, larger deficit and hence the necessity of a further (larger) issue of government bonds. If the initial fiscal stimulus is not reversed, an ever increasing degree of crowding-out of private sector expenditures results. The initial stimulus can stop being the cause of such instability if a monetary expansion is exercised. If, finally, the fiscal policy is expansionary, the long-run level of real output and income will be determined by the government budget constraint and the necessity for a balanced budget in the long-run. The long-run fiscal multiplier is given by the inverse of the marginal tax rate, where the long-run multiplier effects of fiscal policy are larger than in the short-run. By introducing a Phillips curve (a long-run vertical one) in our analysis, we have to face some additional problems.



Since equilibrium requires a balanced government budget in the long-run, bond financed expenditures are accompanied by increases in taxes, because of the increased income level in the long-run. However, the unemployment rate tends towards its natural level in the long-run and this is achieved through capital deepening. To these we must add the fact that increased interest rates accompany the fiscal expansion and the bond issue which lead to capital shallowing; thus, long-run instability is unavoidable. We can overcome this problem by allowing for monetary expansion.

In what follows we will discuss the implications of expansionary fiscal policy, taking into consideration the balance of payments.

a) Fixed exchange rates and zero capital mobility.

If we ignore relative competitiveness and assume that the same import content exists in the components of final demand, in the long-run the expansionary effects are entirely exported and private sector expenditures are crowded out on a one to one basis (the expansionary effects refer to balanced-budget fiscal changes or to a monetary expansion). Thus, an increase in the deficit financed by a monetary expansion has the same effects. Fiscal deficit will raise the level of domestic demand and generate a trade deficit. If the authorities do not sterilize the monetary effects of the trade deficit by bond purchases, the drain of money tightens monetary conditions until the balance of payments returns to equilibrium. This means that imports have regained their former (initial) level and the same happens to income

due to the specification of the import function. In the case of sterilization, but with unstable bond financing, cumulative instability will occur. Since a monetary expansion has similar effects, a money financed deficit will not reverse this effect).

The evidence from different studies does not show clearly the implications of a fiscal stimulus in aggregate demand under different exchange rates regimes. The longer-run effects of fiscal policy under fixed exchange rates will be offset, while under a floating exchange rate regime they may be increased. However, the impact on the level of output depends on the conditions of the labour market and the pricing behaviour adopted.

The effects may be different if government expenditures have a low import content and are directed to domestic goods. Considering that the wealth effects arising from the trade surplus (the surplus results because of the fall in the average import propensity as government spending with low import content displaces other expenditures) have an expansionary effect, demand rises reducing the surplus. Crowding-out may partially occur, since we assume a non-zero import component of government expenditure. Crowding-out does not occur in the case of a zero import component of government expenditure. If sterilization occurs and bond financing is unstable cumulative instability occurs.

If we include price induced adjustments, a weaker initial trade position (loss of relative competitiveness) and lower expansionary effect on the domestic economy will result. In the long-run the contractionary

effect of price increases will interact with the wealth adjustment. Finally, under capital shallowing a super crowding-out will occur, while under capital deepening only partial crowding-out occurs. Capital deepening or shallowing depends on interest rate movements and the former will result from expansionary monetary policy or sterilization, because both lower the ratio of non-monetary to monetary wealth.



## b) Fixed interest rates with capital mobility.

In this case, it should be mentioned that the greater the degree of capital mobility the greater the extent to which the interest rates changes, resulting from fiscal (and/or monetary expansion) policy, will be stemmed by induced flows on money capital. A fiscal stimulus will induce a capital inflow offsetting the increase in interest rates and the expansionary effects are increased. A money financed deficit will reduce these effects (the role of sterilization is reduced, since the greater the degree of capital mobility the more difficult the implementation of such policies becomes). Furthermore, in analysing the longer-run effects of fiscal policy with capital mobility, it should be considered that different effects are exerted by changes in current and capital accounts.

The longer-run effects of fiscal policy differ from those of the previous case (no capital mobility) in that no capital shallowing or deepening occurs. This means, according to the neoclassical view, that output will return to its initial growth path. Furthermore, this implies that to achieve external equilibrium, relative competitiveness must remain unchanged or must fall, if government spending has a lower import content than the average. We should also mention that the inflow of money capital from overseas increases the interest burden in the current account.

In the long-run an increase in government expenditure will induce a current account deficit equal to the deficit in the budget. This means an indefinite deple-

tion of foreign exchange reserves. Continuous increase in official overseas borrowing will imply policy changes to alter this situation. If we disregard the possibility of a contractionary effect in the goods market, the adjustment to the above mentioned equilibrium can take place through output or price increases. The smaller the equilibrium budget deficit the smaller the deterioration in the external account. The opposite takes place through price increases adjustments.

Under bond financing (Neoclassical view) the rise in interest rates and capital shallowing will lead to the fall of real output in the long-run. The final result is the deterioration of external account via the price increase.

#### c) Floating exchange rates

If we assume limited capital mobility, the effect of demand changes on the external account are offset by changes in the terms of trade, induced by exchange rates changes and domestic price changes. Dropping the assumption of limited capital mobility, the standard analysis (Flemming, 1962, and Mundell, 1968) has attributed a limited role to fiscal policy to influence the level of aggregate demand. This is because a fiscal stimulus increases the interest rate, leading to the appreciation of exchange rate as a result of the potential capital inflow. The consequences are a reduced overseas demand and a fall in international competitiveness. A monetary expansion leads to opposite results. Thus, assuming a deficit financed by monetary expansion the adverse results from a fiscal expansion are mitigated. According to



other writers (e.g. Niehan, 1975) the trade flows are determined by long-run or permanent exchange rate levels, so that the short-run effect of exchange rate changes will be limited. In addition to this, as Dornbusch (1976) emphasizes, any change in exchange rates will be checked by speculative capital flows, if exchange rate expectations are regressive, thus limiting the force of the argument (the Mundell-Fleming result). If we introduced inflationary expectations, an increase in government expenditure will be accompanied by a fall in the exchange rate with the currency going to a forward discount. For an exchange rate equilibrium, domestic interest rates will have to rise to offset the forward discount. The result will be increased money velocity and expansion of demand.

A study by Katz (1977) pointed out the possibility for fiscal policy to exert an opposite impact on aggregate demand under conditions of floating exchange rates and perfect capital mobility, and for monetary policy to have reduced effects on money demand, which allows for the change in money velocity. If this effect is a fact, the impact of fiscal policy is enhanced by a greater capital mobility. In the case where no wealth effect on expenditure exists but there is a positive one on money demand, the impact of monetary policy is neutralized.

Under bond financed deficit, the budget deficit equals the increase in government spending, since the level of output, in the short run, remains unchanged. The trade account deteriorates to offset the stimulus of demand by the same amount and hence is equal to the



budget deficit. Hence, no crowding out occurs, since there are no changes in private sector wealth. The issue of bonds is taken up by the overseas sector as the counterpart to the trade deficit. With flexible prices, the scope for any long-run effects from once for all changes in monetary and/or fiscal policy is limited.

We can conclude that the effects of fiscal policy in aggregate output differ under different exchange regimes. In the longer-run, under fixed rates, fiscal effects will be offset (except in the case where government expenditures have a significantly lower import component). However, under flexible exchange rates these effects may be augmented. These demand effects affect output according to the conditions in the labour market and the pricing behaviour. Under a neoclassical interpretation, the output will respond only in the short-run and the long-run effects will be absorbed into higher prices. Under imperfect capital mobility, expansionary monetary policy generates capital deepening which results in an increased output, while fiscal policy is more likely to generate the opposite.

## Appendix 1

some of the government expenditures are index linked). At point A the budget is balanced. If the actual budget is in surplus OX at actual money income B, and an increase in taxes has taken place, the budget function shifts upwards, as pointed by the dotted line. If, consequently, this increase in taxes depresses the economy so that actual income falls to point C, a deficit equal to OY appears. A deficit OY indicates expansionary fiscal policy compared with the surplus OX. However, if the surplus had been calculated at a constant level of income OB, the increase in surplus from OX to OZ would correctly, indicate the policy of the government.

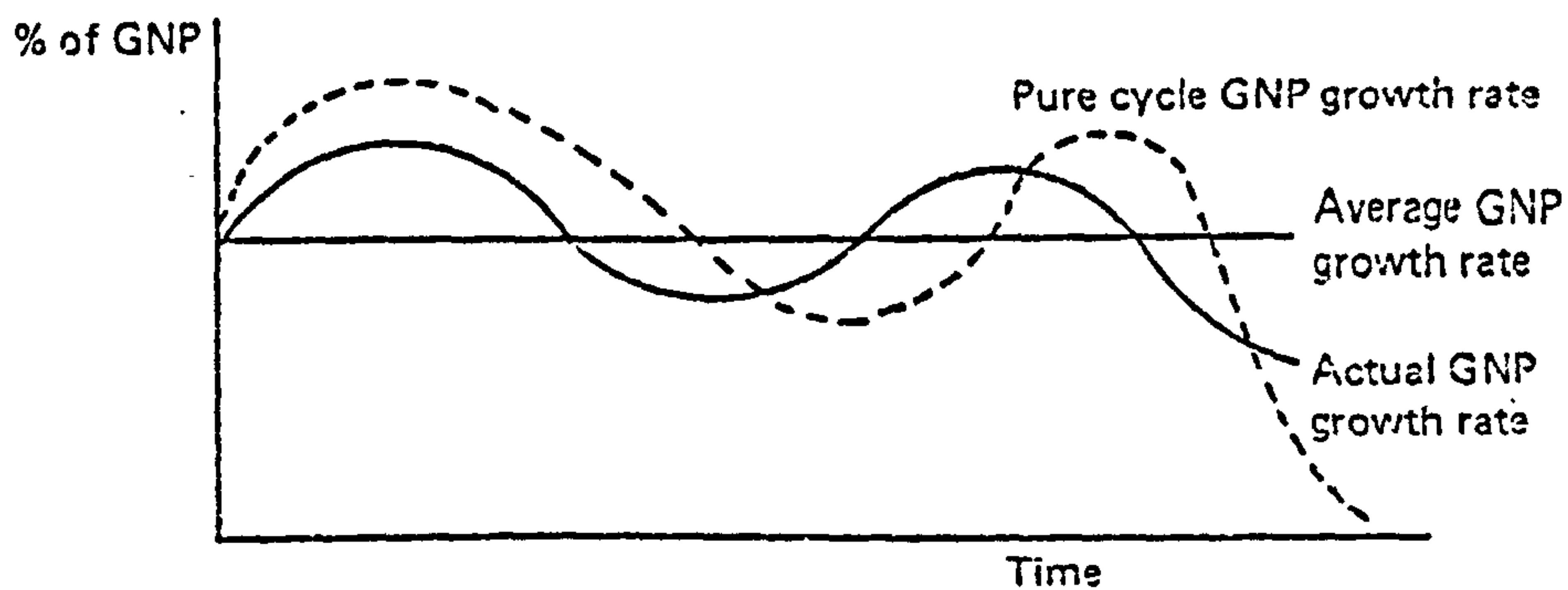
However, measuring the surplus at a constant level of money income (or at the full employment income) can be misleading in cases of changes in the slope of the budget function. Lines G and G' illustrate this deficiency of FES. Line G shows a change in the budget function created by an increase in social benefits. The FES remains unchanged, however, at high levels of unemployment this increase in expenditure may exert a considerable impact on current income levels. The G line is drawn in such a way as to incorporate no change in the FES. Even if there is a change in FES as indicated by line G', the discretionary fiscal action can be interpreted adequately only by reference to the current prevailing income level. The budget line G' indicates a less restrictive fiscal policy than budget line F does, according to the full employment income OB. If the actual income is OC the same interpretation of the budget can no longer hold. Since  $OY < OY'$ , a smaller



deficit and a more restrictive fiscal policy are indicated. This means that where the gap between actual and full employment income is substantial and there are indicators that is long lasting, in this respect the standardized budget is more reliable.

Figure I-3

Fiscal performance measures



---

Figure I-3 illustrates the method proposed by B. Hansen (1968). It depicts a stabilising fiscal policy, since the actual GNP growth rate is closer to the average GNP than the pure cycle GNP growth rate is.

## CHAPTER II

A) The New Approach

The new approach to measure the fiscal stance emerges from the analysis which pertains to the government financial policy<sup>1</sup>. This analysis takes into account the choice of taxation versus borrowing, the composition or structure of taxes and the characteristics of the debt instruments issued by the government. Under this analysis, monetary policy, exchange rate management and foreign exchange market intervention, therefore, belong to financial policy as much as open market operations or bond issues to finance the deficit.

Considering the imperfections of capital markets and the ability of the government to promote the welfare of the country, the intervention of the government in the economy through its financial policy can be justified by considering its contribution to remedy capital market imperfections and improve the welfare of the nation.

The ability of the government to act in such a way results from the fact that the opportunity set of the government differs from the private agents' in that the institution of government is longer-lived and this means that governments can be a substitute for some of the nonexistent forward markets and that government has the

---

<sup>1</sup>For a comprehensive exposition of this approach see Buiter, 1982, 1983 and Cukierman & Mortensen, 1983.

power to charge. This power enables government to borrow on much better terms than individuals do. Total current and future national income serves as a collateral for borrowing. Default through insolvency has a smaller role to play for government debt than for the private one. What this approach implies is that the government can relax the binding constraints on private consumption, investment, production and portfolio allocation through its financing policy. Defining this kind of policy as active financial policy, we will examine the way it affects risk sharing, the extent to which households can smooth consumption over the life cycle and capital formation.

According to the traditional theory of the balanced budget multiplier, a change in both exhaustive public spending and taxes net of transfers is required as a response to demand shock without deficit. The new approach argues that if public sector consumption spending is worthwhile, and the time profile of public sector capital formation depends on the time profile of future planned public sector production, a change in taxes and transfers only would be the appropriate optimal budgetary stabilization policy. Public consumption, like all consumption spending, should be smoothed over time in line with permanent income. The optimal public sector's consumption programme determines the public sector's capital formation time profile. Public works and other public spending on goods and services can be used in such a way as to regulate demand and economic activity, but at the same time, can distort the optimal private-



public sector consumption mix. This can be avoided by well designed changes in the taxation, borrowing and money financing mix.

The new approach suggests that exhaustive expenditures should aim at the best feasible public-private consumption mix out of permanent national income. At the same time, stabilization policy should decide upon the mix of taxes, transfers, borrowing, and money creation which can optimize national permanent income and private disposable income in line with private permanent income. All these ensure an adequate share of disposable realizable (financial) private wealth in total or comprehensive private wealth (the latter includes illiquid assets and human capital). In the next paragraph we summarize some of the implications of this new financial policy by examining the crowding out and inflationary pressure induced by the financial policies of government.

The first step towards constructing adequate measures for the crowding out and/or inflationary impact of financial policy is to examine the drawbacks of conventional balance sheets and current accounts. A misleading picture of the change in real net worth of the public sector emerges through the conventionally measured public sector financial surpluses. Capital gains and losses on outstanding stocks of marketable financial assets and liabilities are not included in the real value of nominally denominated public sector debt due to inflation.

A second omission is the revaluation in non-marketable (and often merely implicit) assets and liabilities

such as the future stream of tax receipts and the future stream of benefit payments. If the conventionally measured balance sheet and flow of funds accounts can include the above mentioned omissions then the private agents and national economies can approximate the behaviour that would be adopted if comprehensive wealth or permanent income were the only binding constraints on economic behaviour (given the objective of the financial policy to keep disposable income in line with permanent income and ensure an adequate share of disposable financial wealth).

The conventionally measured public sector balance sheet omits the value of the stock of social overhead capital, the value of government owned land and mineral rights and the present value of future planned tax revenues. On the liability side it omits the present value of social insurance and other entitlement programmes. Furthermore, the conventionally measured public sector financial surplus evaluated at current or constant prices is not an indicator of the change in the real net worth of the public sector. This is because it omits capital gains and losses on outstanding stock of government assets and liabilities due to a) relative price changes (e.g. changes in the real value of mineral rights), b) inflation (changes in the real value of nominally denominated public sector debt), and c) exchange rate changes (changes in the real value of foreign currency-denominated assets and liabilities). To these omissions we must add the capital gains and losses emerging from the change in tax and entitlement programs in

the future revenue base and in discount rates which may significantly alter the planned or expected future streams of taxes and benefits and their present value. These capital gains and losses are part of the permanent income. In inflationary periods a public sector deficit (as measured conventionally) may or will be turned to surplus if it had taken into account the inflation induced changes in capital gains and losses on outstanding stocks of government assets and liabilities. The same argument applies to the conventionally measured balance of payments, if we consider the changes in the value of external assets and liabilities relevant to changes in the exchange rate. Moreover, current changes in security legislation are likely to alter future flow of benefits and contributions. These changes will affect current financial asset prices and change the rate of return; larger anticipated future deficits may raise current interest rates. The inclusion of the above item in balance sheets of public and private sector would explain the behaviour of private agents, government, and international organizations if they had to choose their spending, saving, lending, production and portfolio allocation programs under a first-best world in which the economic agents are only constrained by comprehensive wealth or permanent income. This means that private agents are not constrained by illiquidity and non-mark-etability of certain assets. These assets can be pension rights, human capital and expected future tax cuts or transfer payments. Individuals do not have the collateral that enables them to borrow in order to spend in



line with permanent income. Capital market imperfections distort the optimal behaviour of these agents which would have prevailed if only permanent and comprehensive wealth constraints were being operated.

The difference between the conventionally measured flow of funds and balance sheets and the comprehensive or permanent income accounts comes from the fact that the former helps to trace the circumstances when the behaviour of economic agents is constrained by factors different from comprehensive net wealth, while the latter identifies the conditions of optimum behaviour of individuals under the constraint of optimal permanent income or comprehensive wealth. In other words, the national authorities taking into consideration the conventional accounting can accomodate private agents to spend and save in line with permanent income or to produce according to long-run profit or social benefit.

When the case of international economy is considered, the conventional accounting helps the international organizations to decide upon the credit to be offered to different countries for development relevant to their long-run potential. Conversely, the comprehensive balance sheets or permanent wealth accounts and their flow counterparts help to describe the changes in real sectoral net worth or permanent income over time. Thus, this approach does not reject the usefulness of conventional accounts but considers it as an essential input into optimal policy design. Conventional accounts are essential for taking into account the actually binding constraints on economic behaviour, while comprehensive wealth

and permanent income accounts renders the minimal data base required for proper policy evaluation and design.

It should be mentioned that even when product and factor markets clear stabilization policy under this new interpretation is desirable because of its intertemporal allocative effects.

Where labour and output markets are in disequilibrium, the capital market imperfections spill over into the market for output and labour (the existence of the multiplier reflects a capital market imperfection -the difficulty of borrowing against the security of anticipated future labour income). To see that more clearly consider some exogenous shock in demand which sets in motion contractionary or expansionary multiplier processes. The usefulness of automatic multipliers and of counter cyclical budget deficit derives from current disposable income constraints on spending and capital market imperfections. It should be mentioned that current disposable income constraints on private consumption need not be absolute, if we consider that individuals can increase their stock of liquid savings and vary it procyclically. This possibility relaxes the constraints for those who can borrow on very unfavourable terms and enables them to consume in excess of their current disposable income. Individuals can smooth their consumption out over the cycle. Nevertheless, those actions on behalf of individuals are considered inferior substitutes for access to borrowing on the terms available to government. Having presented these remarks, it can be argued that in the Keynesian models the usefulness of

financial policy is apparent and strengthened by the new view of stabilization policy. In simple words the Keynesian theory indicates larger deficit (smaller surpluses) when effective demand is depressed and smaller deficits when demand is buoyant. By reducing taxes (net of transfers) and increasing borrowing (the deficit can be financed by individuals who are not constrained by current disposable income) during the downswing, exhaustive public expenditures will be sustained and total demand will decline by less than if taxes had been constant. In the upswing the debt can be repaid out of higher than normal taxes; this can be achieved without fears of constrained consumption, since it is likely that more private agents are constrained in their spending by current disposable income during the downswing than during the upswing. Considering that financing policy was defined as the proper transfer-borrowing-money creation mix, the cyclical stabilization policy is in line with the new approach. The conclusion could be that letting taxes net of transfers vary with the current level of economic activity rather than making them a function of long-run or permanent income is a reasonable policy. Manipulating taxes (net of transfers) in such a way, consumption is smoothed out over the cycle.

It should be mentioned that successful financial policy leaves unchanged the trend real stock of debt or the debt/output ratio. This condition is important as far as the crowding out is concerned and if real interest rates are an increasing function of current and anticipated future deficits. If the deficits are trans-



itory and reversible (during the upswing), then there is no scope for interest rates to increase. In contrast, if myopic considerations are operating the deficits or surpluses associated with "cyclical" stabilization policy will increase real interest rates and lead to crowding out of interest sensitive spending. This crowding out can be avoided by monetization provided that it would be reversed during the upswing; thus, there would be no effects on trend monetary growth and on inflationary expectations. This monetization can be accomplished without any adverse effects the smaller the number and the wealth of private agents that are not constrained by current disposable income and liquidity. Monetization is imperative where there is an inelastic demand for bonds, which means larger increases in interest rates to unload additional bond issues on the private sector.

Table II-1 shows the comprehensive consolidated Public Sector balance sheet at current prices.

The concept behind the comprehensive balance sheet is that all items can be expressed in common value terms (this is a very strong assumption since some items are either not marketable ( $K^{*0c}$ ), or not tangible (T,N)). Moreover some of the marketable assets do not have a current observable market price. The conditional mathematical expectation of the uncertain future revenues or outlays are discounted using "risk adjusted" discount rates<sup>2</sup>. This certainty is a serious limitation of this

---

<sup>2</sup>If the future flow of any variable is highly uncertain

Table II-1

The Public Sector Balance Sheet

<u>Assets</u>		<u>Liabilities</u>	
$P_k^{soc} K^{soc}$	: Social overhead capital (non - marketable)	$B^h$	: Net interest-bearing debt denominated in domestic currency, held by residents
$p_g K^g$	: Equity in public enterprises (partly potential marketable)	$B^f$	: Net interest bearing debt denominated in domestic currency, held by non-residents.
$p_R R^g$	: Natural resources assets	$eB^{+h}$	: Net interest-bearing debt, denominated in foreign exchange held by residents.
$eE^+$	: Net foreign ex change reserves	$eB^{+f}$	: The same as above, held by non-residents
$T$	: Present discounted value of future ex - pected taxes net of transfers (including so- cial security contributions, tariff revenue - implicit assets	$\tilde{p}B^h$	: Net interest bearing index-linked debt, held by residents
$p^{AM}$	: Imputed net va- lue of the go- vernment's cash monopoly	$\tilde{p}B^f$	: The same as above, held by non-residents.
		$H$	: Stock of high powered money.
		$N$	: Present value of social insurance and other entitlement programs, implicit liability.
		$W^g$	: Public sector net worth

comprehensive balance sheet. Given, also, the heterogenous sets of assets, each of the items in the balance sheet would be modelled as having potentially distinct behavioural effects. The public sector's overhead capital is assumed to yield an implicit rental  $p_k^{soc} K^{soc}$  corresponding to the public sector's

<sup>2</sup>(continued)  
the present discounted value  $(T, N A^M)$  of the variables will be very small.

Table II-2

Public Sector Income and Expenditure and Capital Financial Accounts

Debit		Credit
	<u>Current Account</u>	
$p(G^c + G^{s \circ c})$	: Government consumption incl.	: Tax receipts (including social
	imputed rental from social	security contributions)
$\delta(p_K^{s \circ c} + p_G K^f)$	overhead capital	$ r^s p_G K^f + r^s p_R R^f$ : Profits from public enterprises and
$n$	: Capital consumption	ownership of natural resources.
$i(B^h + B^f) + ei(B^{+h} + B^{+f})$	: Transfer and benefit payments	
$+rp(\tilde{B}^h + B^f)$	: Interest paid	$ ei^+ E^+$ : Interest received.
$S^f$	: Surplus on current account	$ r^{s \circ c} p_K^{s \circ c} K^{s \circ c}$ : Imputed returns from social overhead
		capital.
	<u>Capital Account</u>	
$p_K^{s \circ c} (\Delta K^{s \circ c} + \delta K^{s \circ c})$		$ S^f$ : Surplus on current account
$+p_G (\Delta K^f + \delta K^f)$	: Gross investment in structures and equipment	$ \delta(p_K^{s \circ c} K^{s \circ c} + p_G K^f)$ : Social consumption
$-[\Delta B^h + \Delta B^f]$		
$+e(\Delta \tilde{B}^{+h} + \Delta B^{+f} - E)$		
$+p(\Delta B + \Delta \tilde{B}^f) + \Delta H$	: Net financial investment	
$p_R \Delta R^f$	: Net purchase of existing assets	

All the variables are at current (market or implicit) prices.



consumption of social overhead capital service  $pG^{SOC}$  on the debit side of the public sector current account.

If some of the enterprises are loss makers, then the latter item ( $pG^{SOC}$ ) item has a negative value and appears in the liability side of the balance sheet. The inclusion of  $p^A M$  (the real capital value of the state's note issue monopoly) helps to consider money as a social asset producing liquidity and convenience services. By treating money like this, it remains as an item in the balance sheet when the public sector assets and liabilities are netted out.  $A^m$  is the present discounted value of income at each future time from the government assets equal in value to the stock of high-powered money at that time. Consolidating the current and capital accounts of table II-2, we obtain the public sector balance constraint <sup>3</sup>:

$$\frac{I}{p} - \frac{n}{p} - \frac{G^c}{p} - \frac{p_K^{SOC}}{p} \delta K^{SOC} - \frac{p^G}{p} \delta K^G - \frac{i(B^h + B^f)}{p} \\ - \frac{ei}{p} + (B^{*f} + B^{*f} - E^*) - r(\tilde{B}^h + \tilde{B}^f) + r^G \frac{p^G}{p} K^G + r^A \frac{p^A}{p} R^G =$$

<sup>3</sup>This public sector balance constraint has been obtained under the following assumptions :

- 1) The same price,  $p$ , is attributed to the government consumption  $G^c$  and the imputed rental services from overhead capital.
- 2) There exists a uniform depreciation rate  $\delta$  for different types of capital.
- 3) The same interest rate was supposed to be paid on foreign exchange reserves and foreign-currency denominated financial claims.

$$\frac{p_K^{soc}}{p} \Delta K^{soc} + \frac{p^G}{p} \Delta K^G + \frac{p^R}{p} \Delta R^G - \frac{(\Delta B^h + \Delta B^f)}{p} - \frac{e}{p} (\Delta B^{+h} + \Delta B^{+f} - \Delta E^+) - (\Delta \tilde{B}^h + \Delta \tilde{B}^f) - \frac{\Delta H}{p} \quad (1)$$

The real financial surplus<sup>4</sup> (given from (1)) is likely to be a poor indicator of the change in the real net worth of the public sector (defined from the balance sheet in table II-1) and this can be clearly seen by the following equation which represents the change in the real net worth of the public sector.

$$\begin{aligned} \frac{d(W^G)}{dt p} &= \frac{p_K^{soc}}{p} \Delta K^{soc} + \frac{p^G}{p} \Delta K^G + \frac{p^R}{p} \Delta R^G - \frac{(\Delta B^h + \Delta B^f)}{p} \\ &- \frac{e}{p} (\Delta B^{+h} + \Delta B^{+f} - \Delta E^+) - (\Delta \tilde{B}^h + \Delta \tilde{B}^f) - \frac{\Delta H}{p} \\ &+ \frac{(\Delta T - \Delta N)}{p} + \Delta A^H + \left( \frac{\Delta p_K^{soc}}{p_K^{soc}} - \frac{\Delta p}{p} \right) \frac{p_K^{soc}}{p} K^{soc} + \left( \frac{\Delta p^G}{p^G} - \frac{\Delta p}{p} \right) \frac{p^G}{p} K^G \\ &+ \left( \frac{\Delta p^R}{p^R} - \frac{\Delta p}{p} \right) \frac{p^R}{p} R^G + \frac{\Delta p (B^h + B^f + H)}{p} - \left( \frac{\Delta e}{e} - \frac{\Delta p}{p} \right) \frac{e}{p} (B^{+h} + B^{+f} - E^+) - \frac{\Delta p (T - N)}{p} \end{aligned} \quad (2).$$

From (1) and (2) we can estimate the change in real net worth which is due to capital gains and losses  $W$  and to changes in the value of the implicit assets and liabilities  $\Delta'$ .

$$\begin{aligned} W &= \left( \frac{\Delta p_K^{soc}}{p_K^{soc}} - \frac{\Delta p}{p} \right) \frac{p_K^{soc}}{p} K^{soc} + \left( \frac{\Delta p^G}{p^G} - \frac{\Delta p}{p} \right) \frac{p^G}{p} K^G \\ &+ \left( \frac{\Delta p^R}{p^R} - \frac{\Delta p}{p} \right) \frac{p^R}{p} R^G + \frac{\Delta p}{p} \left( \frac{B^h + B^f + H}{p} \right) - \left( \frac{\Delta e}{e} - \frac{\Delta p}{p} \right) \frac{e}{p} (B^{+h} + B^{+f} - E^+) \\ &- (\Delta p/p) (T - N) \quad (3), \end{aligned}$$

$$\Delta' = \frac{(\Delta T - \Delta N)}{p} + \Delta A^H \quad (3a)$$

<sup>4</sup> Deflated by the general price level.

Equations (2), (3) and (3a) represent ex post or realized measures only. If we intend to use changes in comprehensive wealth for planning purposes we must use anticipated changes in prices and in the value of implicit assets and liabilities.

B) Amortization of Public Debt through inflation  
and currency appreciation

From W we can obtain the change in net worth, due to general inflation, W'

$$W' = \frac{\Delta p}{p} \left( \frac{B^h + B^f + H}{p} \right) - \left( \frac{\Delta e}{e} - \frac{\Delta p}{p} \right) \frac{e}{p} (B^{+h} + B^{+f} - E^+)$$

This result is derived under the assumption that all the money prices change at the same rate, to simplify the presentation of W'. If we ignore the foreign sector we have :

$$W' = \frac{\Delta p}{p} \left( \frac{B^h + H}{p} \right)$$

This ammortization of public debt should be put below the line in measuring the financing of the government's net real borrowing. If nominal rates rise with the rate of inflation, the deficit will be larger as the interest payments will be higher and it will be offset by the reduction in the real value of government's stock of nominally denominated interest bearing debt,  $W'' = (\Delta p/p)(B^h/p)$ . Subtracting this real value of government's stock of nominally denominated interest bearing debt from the conventionally measured deficit we will obtain the deficit at the real interest rate.



Changes in the real value of the stock of government's interest bearing debt are used as proxy of the financial crowding out, the exact nature of which is model specific.

Private agents, with no money illusion, would demand real stocks of assets in their portfolio. This means that they will try to compensate the inflation erosion in the real value of their existing assets holdings by absorbing nominal government bonds equal to that erosion. Thus an increase in the real interest rate is not required for further additional government bond issues to be absorbed. This hypothesis holds if the Fischer's argument is valid, that is the real interest rate is invariant with respect to the rate of inflation. Furthermore, additional financing by money creation equal to the inflation tax on existing money balances,  $(\Delta p/p)(H/p)$ , keeps constant the real money balances. Thus a deficit like  $W'$  which is financed through an amount equal to  $(\Delta p/p)[(B^h + H)/p]$  implies constant real interest rates and a constant degree of financial crowding out pressures.

We can now consider the implication of the change in the real value of public sector deficits on the conventionally measured government deficit. Ignoring  $G^{*oc}$ ,  $K^{*oc}$ ,  $R^G$  we have :

$$\frac{(\Delta M + \Delta B^h)}{p} + \Delta \tilde{B}^h = G^c + G^I + \delta K^G - \tilde{\tau} + \frac{(r + \Delta p)}{p} \frac{B^h}{p} + r \tilde{B}^h - r^G K^G \quad (4)$$

given that  $p_G = p$ ,  $G^I = \Delta K^G$  (= net investment by public sector enterprises),  $\tilde{\tau} = (\tau - n)/p$ ,  $r = i - \Delta p/p$ , we have :

$$\begin{aligned} d/dt[(B^h + p\tilde{B}^h)/p] = & G^c + G^I + \delta K^G - \tilde{\tau} + r[(B^h + p\tilde{B}^h)/p] \\ & - r^G K^G - \Delta H/p \end{aligned} \quad (5).$$

To find the crowding out pressure of fiscal stance through government financial policy we have to estimate equation (5). If  $d/dt[(B^h + p\tilde{B}^h)/p] > 0$  crowding out exists, given the monetary financing  $\Delta H/p$ .

If we wish to estimate the crowding out on total national capital formation we can use the following expression:

$$\begin{aligned} d/dt[(B^h + p\tilde{B}^h - pK^G)/p] = & G^c - \tilde{\tau} + r[(B^h + p\tilde{B}^h - pK^G)/p] \\ & + [r - (r^G - \delta)]K^G - (\Delta H/p) \end{aligned} \quad (6).$$

If  $(r^G - \delta) > r$ , (the net rate of return exceeds the opportunity cost of borrowing,  $(r)$ ), the corrected measure of the deficit is further reduced.

The decline in the real value of total public sector tangible net worth is given by :

$$\begin{aligned} d/dt[(H + pB^h + p\tilde{B}^h - pK^G)/p] = & G^c - \tilde{\tau} + r[(B^h + p\tilde{B}^h - pK^G)/p] \\ & + [r - (r^G - \delta)]K^G - [(\Delta P/p)(H/P)] \end{aligned} \quad (7).$$

Equation (7) represents an inflation corrected government current account deficit. This measure of crowding

out can be used for a single and/or medium period and for the steady state.

If we take into consideration the changes in the total real value of foreign currency denominated financial claims induced by inflation and exchange rate depreciation, we have the following corrected measure of changes in net worth:

$$W' = \Delta p/p[(B^h + B^f + H)/p] + (\Delta p^*/p^*)[(B^{*h} + B^{*f} - E^*)/p^*] \quad (8),$$

given that  $(\Delta p/p) - (\Delta e/e) = \Delta p^*/p^*$ ,  $ep^* = p$ .

Assuming that the country is small, the conventionally measured public sector deficit is :

$$(\Delta H/p) + (e/p)(\Delta B^{*f} - \Delta E^*) = G^c + G^I + \delta K^G - \tilde{r} + (ei^*/p)(B^{*f} - E^*) - r^G K^G \quad (9).$$

Equation (9) was derived under the assumption that the country has no developed domestic capital market, thus,  $B^h = B^f = \tilde{B}^h = \tilde{B}^f = B^{*h} = 0$ .

The current account deficit of the balance of payments is given by (10) :

$$e/p(\Delta B^{*f} - \Delta E^*) = -X + (ei^*/p)(B^{*f} - E^*) \quad (10)^1.$$

If  $i^* = r^* + (\Delta p^*/p^*)$ , we have

$$(e/p)(\Delta B^{*f} - \Delta E^*) = -X + (e/p)[r^* + (\Delta p^*/p^*)](B^{*f} - E^*) \quad (11).$$

Equation (11) implies that the higher the rate of world inflation, the higher the deficit in the current account. However, the change in net real external liabilities is the same, since the higher debt service above the line in the current account balance will be

---

<sup>1</sup> This result is justified if we assume that the world real rate of interest is independent of the inflation rate.



offset by the larger reduction in the real value of its external liabilities (see equation (1))<sup>2</sup>.

The conclusion holds only when  $(\Delta p/p) - (\Delta e/e) = \Delta p^*/p^*$ .

In the real world significant departures from p.p.p.<sup>3</sup> are realized which means that whereas

$$(\Delta p^*/p^*) > [(\Delta p/p) - (\Delta e/e)]$$

the external indebtedness of the country will increase.

### C) Budgetary policy and monetary growth

#### 1) Closed economy

The following constructed measure for monetary growth can be used as a benchmark for a budgetary policy, free from inflationary implications.

From the conventionally measured government budget constraint :

$$(\Delta M + \Delta B^h + p\Delta \tilde{B}^h)/p = G^c + G^I + \delta K^G - \tilde{\tau} + [r + (\Delta p/p)](B^h/p) + r\tilde{B}^h - r^G K^G$$

we obtain the following expression for the proportional rate of growth of the national money stock (=high powered money) :

$$\begin{aligned} \Delta H/H = V \{ & [(G^c + G^I + \delta K^G - \tilde{\tau})/Y] + [r + \Delta p/p](B^h/pY) + [r(\tilde{B}^h/Y)] \\ & - r^G(K^G/Y) - (\Delta B^h/pY) - (\Delta \tilde{B}^h/Y) \} \end{aligned} \quad (12).$$

where  $V = pY/H$  is the income velocity of circulation of money. In calculating the implications of the fiscal stance for monetary growth we define the financing poli-

<sup>2</sup> The change in net worth of the public sector equals the current account deficit if we assume that the government borrows from abroad to finance the deficit, thus implying  $\Delta H = 0$ .

<sup>3</sup> Purchasing power parity.

cy as the one which keeps constant the real values of all government assets and liabilities (other than money) per unit of output. Furthermore, the longer-run implications for monetary growth can be evaluated after the debt-output ratios have achieved some desired long-run values. Equation (12) becomes :

$$\frac{\Delta H}{H} = V \left\{ \frac{G^C - \tau}{Y} + (r - \gamma) \left[ \frac{B^h + p\tilde{B}^h - pK^G}{pY} \right] + [r - (r^G - \delta)] \frac{K^G}{Y} \right\}$$

where  $G^I/K^G = \Delta\tilde{B}^h/\tilde{B}^h = \gamma$  and  $\Delta B^h/B^h = \gamma + (\Delta p/p)$  (13).

The difference between (12) and (13) can be summarized in the following concepts :

a) The reduction in the real value of the stock of nominal government bonds due to inflation is subtracted from the conventional measure.

b) The net debt service term involves real growth since the interest rate is growth adjusted  $(r - \gamma)$ , which under inflationary conditions can be less than  $i = r + \Delta p/p$ .

The reasons for not subtracting the erosion of the real value of the nominal stock of high powered money due to inflation,  $(\Delta p/p)(H/p)$ , from (13), comes from the assumption of the constancy of the real value of all government debt per unit of output. These constant ratios are consistent with any deficit and any rate of inflation.

Whenever large conventionally measured deficits (even if they are cyclically adjusted) correspond to small inflation corrected deficits (which can be surpluses) the current inflation rate should be high. However, these inflation corrected measures of crowding-out

(or -in) and inflationary pressures do not imply the persistence of high crowding out pressures or high rates of monetary growth in the future. This can be seen clearly from equations (5) and (13). If we assume a deficit financed by bonds issue only ( $\Delta H/p=0$ ), crowding-in can be the case depending on the values of  $\tilde{r}$  and  $r^G K^G$  relative to the rest variables of the equation (5). On the other hand, from equation (13) we can have a negative growth of the monetary base even with a zero bond financing  $[(B^h + p\tilde{B}^h)/pY]$ .

As in the case of the inflation corrected deficit for the crowding-out (or -in) issue, equation (13) can not be used to evaluate changes in fiscal stance on monetary growth. A model is required to endogenize the variables  $v$ ,  $r$ ,  $r^g$ ,  $\gamma$ , to reflect change of parameters.

## 2) Open economy

Introducing the foreign sector of the economy into equation (12) we obtain :

$$\begin{aligned} \Delta H/H = & V \{ [(G^C + \delta K^G - \tilde{\tau})/Y] - (r + \Delta p/p)(B^h + B^f)/pY \\ & + r(p\tilde{B}^h + p\tilde{B}^f)/pY + (i^* e/pY)(B^{*h} + B^{*f} - E^*) \\ & - r^G(K^G/Y) + (\Delta K/Y) - [(\Delta B^h + \Delta B^f)/pY] - [(\Delta \tilde{B}^h - \Delta \tilde{B}^f)/Y] \\ & - (e/p)[(\Delta \tilde{B}^h + \Delta \tilde{B}^f - \Delta E^*)/Y] \} \end{aligned} \quad (14).$$

Assuming that all stock flow ratios on the right hand side of (14) are constant, thus denoting that their long-run values have been reached, we have :

$$\begin{aligned} \Delta H/H = & V \{ [(G^C - \tilde{\tau})/Y] + (r - \gamma)[(B^h + B^f + p\tilde{B}^h + p\tilde{B}^f - K^G)/pY] \\ & + [i^* - [(\Delta p/p) - (\Delta e/e)] - \gamma][(B^{*h} + B^{*f} - E^*)/pY]e \\ & + [r - (r^G - \delta)]K^G \} \end{aligned} \quad (15).$$



If p.p.p prevails, then  $r^* = i^* - \frac{\Delta p}{p} - \frac{\Delta e}{e}$

This deficit measure which is suitable for the long-run monetization of fiscal stance considers the effects of domestic inflation, exchange rate appreciation and real growth. If current inflation depends on current and anticipated inflation, (13) and (15) are proper indicators of monetization implied by fiscal stance and are useful tools for short-run and medium-term policy. Conversely, if current inflation depends on current monetary growth, which means that velocity is constant, prices are perfectly flexible and output rises at a constant rate equal to  $\gamma$  (its trend rate), and expressions like (12) and (14) can be used for short-run policy evaluations. The use of (12) and (14) is even more justified if the authorities believe that current rates of inflation and monetary growth are too high to be ignored even under the knowledge that the long-run rates of inflation induced by their fiscal stance are low.

#### D) Cyclical corrections to the public sector deficit

The government budget constraint, ignoring public sector capital and index linked bonds, of the economy presented by equation (4) is given by the following formula :

$$(\Delta H + \Delta B)/p = G^c - \tilde{r} + [r + (\Delta p/p)](B^h/p) \quad (16).$$

If the trend level of output grows at a proportional rate of  $\gamma$  then from (16) we have :

$$d/dt(B^h/p\bar{Y}) = [(G^c - \tilde{r})/\bar{Y}] + (r - \gamma)(B^h/p\bar{Y}) - (\Delta H/p\bar{Y}) \quad (17).$$

Given that  $Y$  (actual output) cycles around its trend and

demand for debt is a demand for real debt per capita and population grows at the same rate as  $\bar{Y}$ , then from (17) we have the following implications.

The government financing exerts an upward pressure on real interest rate when  $d/dt(B^h/p\bar{Y}) > 0$  at the given real interest rate and the given real per capita stock of money balances.

Assuming that exhaustive public spending grows in line with trend output, and taxes net of transfers ( $\tilde{r}$ ) tend to vary positively with the current level of economic activity we have :

$$G^c = g\bar{Y} \quad 1 > g > 0, \quad \tilde{r} = \theta Y \quad 1 > \theta > 0 \quad (18).$$

Substituting (18) into (17) we have :

$$d/dt(B^h/p\bar{Y}) = g - (\theta Y/\bar{Y}) + (r - \delta) (B^h/p\bar{Y}) - (\Delta H/p\bar{Y}) \quad (19).$$

Using the equations (18) and (16) and assuming that the authorities keep constant the stock of real bonds per capita or per unit of trend output we have the following equation for the proportional change in the high powered money:

$$\frac{\Delta H}{H} = V[g(\bar{Y}/Y) - \theta + (r - \delta) (B^h/pY)] \quad (20).$$

If we compare the terms  $-\theta Y/\bar{Y}$  of (19) with the corresponding one on (17)  $-\tilde{r}/Y$ , we can see that the current change in  $B^h/p\bar{Y}$  overstates its trend value where output is below its trend value. The same argument applies to the current rate of growth of the nominal money stock.

We have to consider the following as far as the long-run  $d/dt(B^h/p\bar{Y})$  and  $\Delta H/H$  are concerned:

a) Their long-run behaviour as given by (19) and (20) can be useful tools for financial policy even when

current values of crowding out or inflation rates are of interest (if the case of myopic government is excluded).

b) If current crowding out and current inflation rates depend on expected changes in  $B^h/p\bar{Y}$  and monetary growth respectively, the above cyclical corrected measures are good proxies for future developments, especially when these are transitory swings in the deficits. Thus, they can serve as a short-hand way of calculating the permanent deficit.

c) The above virtues of measures (19) and (20) are valid only when the positive and negative deviations of  $Y$  from  $\bar{Y}$  cancel each other out in the long-run. If this does not occur they must be replaced by an explicit averaging of (19) and (20) over long-run periods.

Having examined the concept of the comprehensive budget deficit, it can be shown how the idea for the new financial policy was originated from the debt-neutrality hypothesis. According to this hypothesis, given the level and composition of the public sector's real spending program on goods and services, private sector behaviour will be invariant with respect to changes in the taxation-borrowing mix that finances this spending.

This argument, which is consistent with the Modigliani-Miller theorem, (see Barro, 1974) implies that since borrowing is merely deferred taxation a switch between taxation and borrowing should therefore not affect the permanent income and consumption behaviour of rational well-informed private agents. Furthermore, monetary financing implies the imposition of an



inflation tax which has the same effect on permanent income as explicit taxes. To see the implications of this neutrality assumption we take the national flow of funds account defined by the following equation:

$$\begin{aligned} & (1/p)[1+r^{s\circ c} p_K^{s\circ c} K^{s\circ c} + r^G p_G K^G + r^P p_K K^P + r^R p_R \bar{R} + i^+ e(E^+ + F^{+h} - B^{+f}) \\ & + i(F^h - B^f) - r p \tilde{B}^f + iH] - [G^c + G^{s\circ c} + C + \frac{\delta}{p}(p_K^{s\circ c} K^{s\circ c} + p_G K^G + p_K K^P) + p^M \frac{H}{p}] \\ & = (1/p)[p_K^{s\circ c} \Delta K^{s\circ c} + p_G \Delta K^G + p_K \Delta K^P + e(\Delta E^+ + \Delta F^{+h} - \Delta B^{+f}) \\ & + \Delta F^h - \Delta B^f - p \Delta \tilde{B}^f] = S/p \end{aligned} \quad (21).$$

The change in real national worth is given by equation (22)<sup>4</sup>

$$\begin{aligned} \frac{d}{dt} \left( \frac{W}{p} \right) &= \frac{d}{dt} \left( \frac{W^P + W^G}{p} \right) = \frac{S}{p} + \left( \frac{\Delta p_K^{s\circ c}}{p_K^{s\circ c}} - \frac{\Delta p}{p} \right) \frac{p_K^{s\circ c} K^{s\circ c}}{p} + \left( \frac{\Delta p_G}{p_G} - \frac{\Delta p}{p} \right) \frac{p_G K^G}{p} \\ &+ \left( \frac{\Delta p_K^P}{p_K^P} - \frac{\Delta p}{p} \right) \frac{p_K K^P}{p} + \left( \frac{\Delta p_R}{p_R} - \frac{\Delta p}{p} \right) \frac{p_R \bar{R}}{p} + \left( \frac{\Delta e}{e} - \frac{\Delta p}{p} \right) \frac{e}{p} (E^+ + F^{+f} - B^{+f}) \\ &- \frac{\Delta p}{p} (F^h - B^f) + \frac{\Delta L}{p} + \Delta A^M \end{aligned}$$

If the expected value of the change in worth is zero,  $d/dt(W/p)=0$ , the national income consumption is in line with permanent national income. This means that government should decide upon the mix of the variables that constitute the current consumption :

$$\text{Current consumption} = G^c + G^{s\circ c} + C + \frac{\delta}{p}(p_K^{s\circ c} K^{s\circ c} + p_G K^G + p_K K^P) + p^M \frac{H}{p} \quad (23).$$

which is consistent with  $d/dt(W/p)=0$ .

---

<sup>4</sup>The change in real net national worth equals savings, plus capital gains on marketable assets plus changes in the imputed or implicit value of nonmarketable items of wealth.

This mix is ex ante indefinitely sustainable and serves as a useful benchmark for consumption planning in this debt neutral economy.

The theory does not accept debt neutrality as good positive economics. It uses it to explain the need for a sustainable fiscal policy under the objective of the financial government policy to keep disposable income in line with permanent income and ensuring an adequate share of disposable financial wealth in total wealth.

Debt neutrality requires lump-sum taxes to operate. Relaxing this assumption and introducing distortionary taxes, transfers, and subsidies, we obtain a consolidated public and private sector balance sheet, which nets out these items. However, a change in the borrowing-taxation mix changes the behaviour of economic agents because it changes relative prices.

Until now, we have analysed the drawbacks of the conventionally measured budget deficit which prevent it from being an adequate measure of the stance of fiscal policy. In the following pages another drawback of the PSBR (as measured by the National Accounts statistics) is going to be analysed. This drawback concerns the sustainability of the monetary targets and financial crowding-out objective and the credibility of the government's budgetary and monetary policy. These concepts are not new but here we will attempt to formulate the PSBR in such a way as to give us enough information about these notions.

To simplify the presentation of the PSBR we reduce the number of variables that have already been used for

the determination of comprehensive wealth.

A proper measure of the PSBR would be the following:

$$g + \Delta K^G - \frac{\tilde{\tau} + iB + c - i^+}{p} \frac{eF^+}{p} - r_G K^G - r^R R + p_R \Delta R^G = \frac{\Delta M + \Delta B + p^C \Delta c - e \Delta F^+}{p} = \text{PSBR} \quad (24).$$

A simple version of the previous comprehensive balance sheet could be also given by

$$W = p_G K^G + p_R R^G + T + \Pi - \left( \frac{M + B + p^C c}{p} \right) + \frac{eF^+}{p} \quad (25),$$

where

$g$  = Public sector consumption.

$\tilde{\tau}$  = Taxes net of transfers.

$K^G$  = Public sector capital stock.

$i$  = Domestic interest rate.

$B$  = Stock of short nominal bonds.

$c$  = Number of consols paying 1 \$ each period.

$p_C$  = Money price of a consol.

$i^+$  = Foreign interest rate.

$F^+$  = Net foreign currency denominated assets of the public sector.

$r^G$  = The rental on public sector capital.

$r^R$  = The rental price of  $R$  (=publicly owned natural resource property rights).

$p^R$  = The price of  $R$ .

$p_G$  = The value of a unit of public sector capital in the public sector.

$e$  = Exchange rate.

$p$  = General price level.

$\Pi$  = The real capital value of the State's note monopoly.

$M$  = Nominal stock of high powered money.



The public sector capital stock represents the present value of its future returns, assuming that it remains in the public sector. This implies that the value of publicly owned unit of capital may be different from the value it would have if it were in the private sector in an alternative use (or replacement cost which is set equal to one), thus,  $p_g$  can take a negative value. The total stock of natural resources property rights is treated as a constant. This means that  $\Delta R^G > 0$  stands for the public's sector acquisition (or sales) of natural resource rights. It is assumed, also, that the expected rates of return on all assets are equalized (see Appendix 2). The entire maturity distribution of the public debt is represented by the shortest and longest maturities.

The public's sector financial deficit on a National Accounts basis places all sales of existing capital below the line with conventionally borrowing and money creation.

The anticipated rate of change of public sector net worth  $d/dt(W)$  is given by :

$$\begin{aligned} d/dt(W) = & r(t)W(t) + (p_g(t) - 1)\Delta K^G(t) - g(t) = \\ & r(t)\{p_g(t)K^G(t) + p_R R(t) + [e(t)F^+(t) - B(t) + p_c(t)c(t)]/p(t)\} \\ & + (p_g(t) - 1)\Delta K^G(t) + r(t)T(t) + r(t)S(t) - g(t) \end{aligned} \quad (26),$$

where  $r$  is the domestic real interest rate.

If  $p_g = 1$  and public sector consumption expenditure  $g(t)$  is greater than the instantaneous (short-run) real return of comprehensive worth  $r(t)$ ,  $W(t)$ , the net worth of the public sector, decreases. The net worth of the public sector is unaffected by the public sector capital

formation, if  $p_g = 1$  (the shadow price of capital in the public sector equals its opportunity cost).

If  $\gamma$  is the natural rate of growth of output, a sustainable fiscal plan would require  $d/dt(W) = \gamma W$ <sup>5</sup> or  $g(t) = \bar{r}(t)W(t) + (p_g(t) - 1)\Delta K(t)$  (27), where  $\bar{r} = r - \gamma$ ,  $\gamma = \Delta \bar{Y} / \bar{Y}$ .

From (26) we can see that if  $g(t)$  exceeds the right hand side of (27) public sector comprehensive net worth falls relative to trend GNP. Assuming that  $p_g$ ,  $p_R^R$ ,  $T$ ,  $S$ ,  $eF^*/p$ , grow at the natural rate, the entire decline in comprehensive net worth of the public sector will decline due to increased interest-bearing debt GNP<sup>6</sup>. Such an increase is interpreted as crowding-out. However, even when  $d/dt(W) = \gamma W$  holds, the interest rate affects the anticipated variations in the share of public consumption in trend net output. Thus, it would be better to define a sustainable fiscal plan when the expression  $G(t) = W(t)$  holds, where  $G(t)$  is the present value of public consumption.

Equation (26) shows that an increase in the public consumption spending program must be accompanied by an increase in the present value of future explicit taxes net of transfers  $T$  and/or in the present value of future  $S$ , if the values of the tangible assets,

$$p_g K^G + p_R R^G - [(B + p_c c)/p] + (eF^*)/p \text{ were to stay stable.}$$

---

<sup>5</sup>Sustainability of the fiscal plan requires public sector net worth to grow at the natural rate of growth of output.

<sup>6</sup>This can be seen clearly from the bracketed term of (26).

However, increases in  $S$  imply increases in the future rate of monetary growth and in the rate of inflation. The previous measure for inflation can then be employed to ensure sustainable net public sector worth.

Alternative methods to increase the net worth of the public sector can be :

a) The improvement of the productivity of public sector capital.

b) The sale of the public sector capital to private sector, if  $P_g < 1$ , and using the proceeds to reduce  $B/p$ .

c) The increase in the price level.

d) Depreciation of currency, if  $F^* > 0$ .

e) A downward jump in the price of long-run interest rates.

Finally, we can construct two measures which convey information about the sustainability of fiscal stance:

a) The excess of current consumption over the constant net worth deficit :

$$\Delta_t^W = g(t) - \bar{r}(t)W(t) + (1 - p_K^G(t)) \Delta K(t) \quad (28).$$

b) The excess of current consumption over permanent income :

$$D^P(t) = g(t) - \bar{R}(t)W(t) \quad (29),$$

where  $\bar{R}$  is the coupon yield on a real consol when the rate of return is  $r(t) - \gamma$  and investors equate anticipated real rates of return.

The concept underlying (b) is that it measures the excess of current consumption over that value of consumption which is consistent with a permanent constant share of public consumption in trend output; that is:

$$[g(t)/\bar{Y}(t)]^P = \bar{R}(t)W(t)/\bar{Y}(t), \quad (30)$$



where

$$\bar{R} = \left[ \int_t^\infty e^{-\int_t^s [r(u,t) - \gamma] du} ds \right]^{-1}$$

Given that  $G(t) = W(t)$ , if  $p_g(t) = 1$

$$\text{and } G(t) = \int_t^\infty e^{-\int_t^s [r(u,t) - \gamma] du} ds$$

from (30) we have :

$$\int_t^\infty \frac{q(s,t)}{Y(s,t)} e^{-\int_t^s [r(u,t) - \gamma] du} ds = \frac{W(t)}{Y(t)}$$

Thus,  $\left[ \frac{q(t)}{Y(t)} \right]$  indicates the indefinitely sustainable

share of public sector consumption in trend GNP. If  $D^W$  and  $D^P$  are greater than zero, net permanent worth of the public sector decreases.

The two indices yield the same results if the real rate of return is expected to be constant and the public sector uses its capital with the same degree of inefficiency as the private sector,  $p_g = 1$ .

Therefore, the sustainability of the fiscal plans as was defined above implies the conditions under which the public sector's net worth can increase to finance a costlier public consumption program.

We can now define the conditions under which a money financed deficit can yield constant inflation rate. Assuming that the present value of future seignorage is given by :

$$s(t) = \int_t^\infty \frac{M_1(s,t)}{M(s,t)} \frac{M(s,t)}{p(s,t)} e^{-\int_t^s r(u,t)du} ds$$

where  $M_1$  is the expected money supply, and

Given the condition of the sustainable fiscal plan :

$$G(t) = W(t) = p_K^G(t)K^G(t) + p_R(t)R^G(t) + T(t) - \frac{[B(t) + p_c(t)c(t) - e(t)F^+(t)]}{p(t)} + S(t), \text{ then}$$

we have :

$$\int_t^\infty \frac{M_1(s,t)}{M(s,t)} \frac{M(s,t)}{p(s,t)} e^{-\int_t^s r(u,t)du} ds = G(t) - p_K^G(t)K^G(t) + p_R(t)R^G(t) + T(t) - \frac{[B(t) + p_c(t)c(t) - e(t)F^+(t)]}{p(t)}$$

This relation gives the amount of revenues to be raised through the inflation tax, given the consumption expenditures and the value of tangible and non-tangible assets of the government.

The constant rate of monetary expansion relevant to government's consumption and the value of tangible assets is given by :

$$\frac{\Delta M}{M} = \frac{V\bar{R}(t)[G(t) - T(t) - (p_K^G(t)K^G(t) + p_R(t)R^G(t))]}{\bar{Y}(t)} + \frac{B(t) + p_c(t)c(t) - e(t)F^+(t)}{p(t)\bar{Y}(t)}$$

where  $V\bar{R}(t) = (p\bar{Y}/M)\bar{R}(t)$ , is the constant income velocity of circulation.

If the long-run rate of inflation is governed by the rate of growth of the money supply  $\Delta p/p = (\Delta M/M) - \gamma$  and the inflation elasticity of velocity is less than unity a higher rate of inflation is implied whenever the present value of public spending is higher relative to non-

monetary assets and liabilities. Thus, credibility for an anti-inflationary policy can be achieved only if public sector's consumption, tax programmes and non-monetary assets and liabilities indicate a higher rate of money supply<sup>7</sup>.

### E) Conclusion

The preceding analysis of the two sets of measures of fiscal stance, that is the traditional and the new one, implies that the former category provides adequate measurements of the fiscal stance, since it distinguishes between automatic and discretionary fiscal policy action. Thus, we can obtain an indicator of fiscal stance, which does not include the effects of the variation of income on the budget. However, according to the new-measure analysis, these traditional measures can give a very misleading picture of the fiscal stance. The reason for this rests on the omission of the changes in the real value of nominally denominated public sector debt due to inflation.

Furthermore, the capital gains or losses on the outstanding stocks of marketable financial assets and liabilities are not included in the flow of funds and the same holds for the revaluation in non-marketable assets and liabilities (the future stream of tax receipts and the future stream of benefit payments), the

---

<sup>7</sup>If we consider only stationary long-run equilibria the equation becomes :

$$\frac{\Delta M}{M} = V \left\{ \frac{g - \tau}{\bar{Y}} - \frac{\bar{R}(p_K K + p_R R)}{\bar{Y}} - \frac{(B + p_c c - eF^*)}{p\bar{Y}} \right\}$$



stock of social overhead capital, the value of government-owned land and mineral rights. The contribution of the new approach to the measurement of fiscal stance is that, even when we exclude the non-marketable assets and liabilities from the budget (given the difficulty in estimating their value), in inflationary periods the measurement of fiscal stance can be more than offset by the depreciation in the real value of the government's nominally denominated public sector debt due to inflation. Even disregarding the above mentioned difficulty, the new approach stresses that it is the financing of the government budget structure (the mix of the tax-transfer-borrowing and money creation) that should be used to implement stabilization policies and not the change in the level and/or the structure of expenditures on goods and services. The latter category could be used to ensure the best feasible public-private consumption mix out of national permanent income.

The need for stabilization policy comes not only from the disequilibria in goods and factor markets but also from the constraints that do not allow private spending to be in line with permanent private disposable income. The importance of the argument of this new approach that consumption should be maintained during a cyclical decline of income is clearly seen if we consider that this would mitigate unemployment and excess capacity, since the existing price and wage rigidities prevent an instantaneous market-clearing response to demand shocks. Finally, the new approach stresses that there is no debt or deficit neutrality,

but both their levels matter for policy planning.

We should mention that all the measures described in the two chapters do not convey true indicators for the short-run or long-run stance of fiscal policy on aggregate demand. For a proper measure of fiscal stance a detailed macroeconomic model is required. The measures of the potentially crowding out/in and or inflationary implications of fiscal policy and the sustainability and creditability of it as well, can be useful for "organizing facts and plans about fiscal policy and its financial policy and to evaluate the mutual consistency of spending and revenue projections of the public sector and its debt objectives, and the monetary targets." (Buiter, 1986).

Appendix 2Calculation of the implicit variables

$$p_z(t) = \int_t^\infty r^z(s,t) e^{-\int_t^s r(u,s) du} ds$$

$$T(t) = \int_t^\infty r(s,t) e^{-\int_t^s r(u,s) du} ds$$

$$N(t) = \int_t^\infty n(s,t) e^{-\int_t^s r(u,s) du} ds$$

$$\Pi(t) = \int_t^\infty r(s,t) \frac{M(s,t)}{p(s,t)} e^{-\int_t^s r(u,s) du} ds$$

8

$$p_c(t) = \int_t^\infty e^{-\int_t^s i(u,s) du} ds$$

where  $p_z$  stands for the price of the  $z$  variable and  $r$  for its rate of return.

Changes in the values of the variables are represented by the following expression :

$$dX(t) = r(t) X(t) - x(t) + \int_t^\infty e^{-\int_t^s r(u,s) du} \left[ \frac{\partial x(s,t)}{\partial t} - x(s,t) \int_t^s \frac{\partial r(u,s)}{\partial t} du \right] ds$$

The first two terms on the right hand side of the equation show how the present value of future benefits changes with unchanged expectation of future flow of  $X$  and future interest rates. The last term shows the effect of changes at time  $t$  in expectations for future, say, benefits  $[(\partial/\partial t) n(s,t)]$  and future interest rates  $[(\partial/\partial t) r(u,t)]$ . If it is expected that the future flows of  $X$  will increase,  $X$ , will increase, while the

---

<sup>8</sup>AM is expressed by the same relation as  $\Pi(T)$  with the high powered money  $H$  in place of  $M$ .



opposite occurs if it is expected that real interest rate will increase.

For every variable  $X$ ,  $x(s,t)$  stands for the value of  $X$  expected at time  $t$  to prevail at time  $s$  (or  $u$ ). The expected instantaneous rate of change of  $X$  is given by :

$$\left[ \frac{d}{dt} X(t,t) \right]' = \lim_{h \rightarrow 0} \frac{x(t+h,t) - x(t,t)}{h}$$

and the unexpected rate of change of  $X$

$$\left[ \frac{d}{dt} x(t,t) \right]'' = \lim_{\substack{h \rightarrow 0 \\ h > 0}} \frac{[x(t,t,t+h) - x(t+h,t)]}{h}$$

So the change in  $X$  is given by :

$$\frac{d}{dt} (X) = \left[ \frac{d}{dt} x(t,t) \right]' + \left[ \frac{d}{dt} x(t,t) \right]'', \text{ if it is assumed that}$$

$$x(s,t) = x(s) \text{ for } s \leq t.$$

Appendix 3Definition of the variables

$p_K^{s o c}$		Price of social overhead capital
$p_G$		Price of public enterprise capital.
$p_K^p$		Price of private capital.
$p_R$		Price of land and natural resource property rights.
$p$		Domestic genaral price level.
$p^+$		Foreign price level.
$e$		Nominal exchange rate (domestic currency price of foreing exchange).
$i$		Nominal interest rate on bonds, denominated in domestic currency.
$r$		Domestic real interest rate.
$r^G$		Rate of return on public enterprise capital.
$p^M$		Non-pecuniary rate of return on money balances.
$r^R$		Rate of return from ownership of land and natural resources.
$r^p$		Rate of return on private capital.
$r^{s o c}$		Rate of return on social overhead capital.
$i^+$		Nominal interest rate on bonds denominated in foreign currency.
$r^+$		Foreign real interest rate.
$K^{s o c}$		Stock of social overhead capital.
$K^G$		Stock of public enterprise capital.
$R^G$		Government-owned land and natural resource rights.
$\bar{R}$		Total natural resources rights.
$B^h$		Domestically held nominal government bonds.

$B^f$	Foreign-held nominal government bonds.
$B^{+h}$	Domestically held foreign currency denominated government bonds.
$B^{+f}$	Foreign held foreign currency denominated government bonds.
$\tilde{B}^h$	Domestically index-linked government bonds.
$\tilde{B}^f$	Foreign-held index-linked government bonds.
$H$	High-powered money.
$E^+$	Stock of foreign exchange reserves.
$N$	Present value of entitlement programs.
$T$	Present value of entitlement programs.
$L$	Present value of future expected labor income.
$W^G$	Public sector net worth.
$W^P$	Private sector net worth.
$W$	$W^G + W^P$ .
$F^h$	Home-currency denominated private claims on the overseas sector.
$F^{+h}$	Foreign currency denominated private claims on the overseas sector.
$K^P$	Private capital stock.
$A^M$	Net value of the government's cash monopoly.
$G^{s \circ c}$	Government consumption of services of social overhead capital.
$G^c$	Government consumption spending (excluding capital consumption and consumption of imputed service of social overhead capital.
$\tau$	current taxes.
$n$	Current transfers and benefits payments.
$\tilde{\tau}$	$(\tau - n)/p$ .
$C$	Private consumption.



X	Trade balance surplus, including net international transfer receipts.
Y	Real output.
Y	Trend output.
l	Current labor income.
S	National saving.
$\gamma$	Natural rate of growth.
$\delta$	Proportional rate of depreciation.
V	Income velocity of circulation of money.
$\Pi$	$A^M$ but using M instead of H for its estimation.
M	Money stock.
g	Total consumption of the public sector.
G	Present value of total consumption.

CHAPTER III

The Greek monetary authorities and the Greek monetary  
system

---

A) A General Description

The Greek monetary authorities include the currency committee, which is chaired by the Minister of Coordination, and where members include the Ministers of Finance, Industry, Agriculture and the Governor of the bank of Greece (the country's central bank). The currency committee's main task is to decide on the monetary and credit policies. The Bank of Greece, BoG, has the responsibility for carrying out the monetary and credit policies determined by the currency committee under its supervision. The central bank has been assigned the following tasks :

- a) The exclusive right of issuing bank notes.
- b) To provide credit to the banking system and to a certain extent to private enterprises.
- c) To finance the government and conduct the transactions of the government concerning its payments and receipts.
- d) It manages the country's foreign exchange reserves and administers all exchange controls and
- e) Since May, 8th, 1975 it has the additional task of determining the selling and buying price of foreign exchange, based on the weighted average values of a basket of the main currencies. The choice of the

currencies and the weighting is determined according to the relative importance of the currency in the foreign transactions of the country. Thus, the Bank of Greece preserves the international and external value of the Greek drachma and plays a direct role in financial intermediation.

The fact that the Bank of Greece is an adviser in the currency committee does not mean that the Bank can form and execute its own policies. Its role is limited to the responsibility of implementing the monetary and credit policies and preserving the country's monetary stability. The currency committee can be interpreted as the link between the country's fiscal and monetary authorities to help their coordination. However, as will be shown, the structure of the Greek economy and the close interdependence of the fiscal and monetary policies prevents the Bank of Greece from carrying out the tasks that have been assigned to it. This is particularly true for the monetary stability.

In understanding the Greek monetary system a representation of the balance sheet of the BoG in a simplified form is needed. Thus, we have the following table.

1

Rearranging the items in the assets and liabilities

---

<sup>1</sup>All assets and liabilities which concern the government in the balance sheet apply to the government sector and to the accounts of the consumer goods and the organisations of trading agricultural products on behalf of the government.



Table III-1

<u>Assets</u>		<u>Liabilities</u>	
R	: Official reserves of gold and foreign exchange	BLF	: Sight liabilities in foreign exchange.
FPE	: Public entities funds at the BoG.	DG	: Government's deposits at the BoG.
CP	: Credit to the non-bank public	BD	: Banks deposits at BoG.
		PED	: Public entities deposits at the BoG
CB	: Credit to the Banks	OD	: Other deposits.
SG	: Government securities	C	: Currency outside the BoG (held by the non bank public, the banks and the
SP	: Non-bank public securities		specilized credit institutions and the
CG	: Credit to the govern ment		government).
OA	: Other assets	OL	: Other liabilities.

where  $R = FEG + IMF$ .

IMF = The IMF position.

FEG = Stock of foreign exchange and gold.

we can derive the sources and uses of the monetary base.

Assets

Net position of the BoG with respect to

a) The foreign sector :  $NR = FEG + IMF - BLF$ .

b) The government and public entities:

$$NG = CG + FPE - DG - PED + SG.$$

c) The private sector :  $NP = CP + CB - OD + SP$ .

d) Other items :  $OI = OA - OL$ .

Liabilities

BD : Banks' deposits with the BoG

C : Currency outside the BoG.

Thus, the source side of the monetary base (MB) is given by:

$$MB = NR + NG + NP + OI \quad (1),$$

while the use side of the monetary base is given by :

$$MB = C + BD \quad (2).$$

The source side of the monetary base serves to

finance the BoG's stock of gold and foreign exchange, its net holdings of government liabilities, loans and advances to the banks and non-bank public. On the other hand, the use side of the monetary base is demanded by the non-bank public as currency and by banks as reserves.

The monetary base is a constraint on the maximum growth of the money supply, and the banks and the public compete for the use of the limited monetary base. It consists of the sights liabilities of the State's monetary authorities and has the same properties as a medium of exchange. It is a reserve asset in the hands of the monetary authorities and it is characterized by perfect liquidity. This latter characteristic means that it is an asset net of any transaction and information costs. (All the assets that are perfect substitutes and are characterized by perfect liquidity must be included in the definition of the MB). Assets that can be converted into the monetary base quickly and without a large loss in value reflect the institutional characteristics of a country. This implies that if one wants to examine the central bank's actual behaviour and how a powerful indicator (or how independent monetary authorities are from the government sector) of it is the monetary base, the institutional constraints must be examined.

In the following paragraphs some aspects concerning the monetary base and its role as an indicator of the authorities actual behaviour are examined.

It has been suggested that a purer indicator of the

monetary authorities actual behaviour would be a monetary base adjusted for bank's borrowing from the central bank. The banks borrowing (CB), from the latter can be thought of as the last resort to finance their lending activities. Furthermore, banks voluntarily determine the volume of it under the fixed by the authorities discount rate and quota. If this part (CB) of the MB is beyond the control of the monetary authorities then it should be subtracted from the MB to obtain an indicator which reflects the authorities policies. Thus we have :

$MB' = NR + NG + NP + OI - CB.$ <sup>2</sup> The monetary base can further be adjusted to take into account the borrowing of banks from foreign credit markets. Foreign borrowing is demand determined (as in the case of domestic borrowing) and this implies that it must be excluded from the MB. To see how appropriate for the Greek MB, this adjustment is we must consider the following institutional arrangements.

- 1) The BoG purchases and sells foreign currency supplied and demanded by banks.
- 2) It imposes regulations on banks' demands for foreign capital.
- 3) It intervenes in the forward-exchange market.
- 4) Banks are not allowed to hold their own permanent foreign reserves.

---

<sup>2</sup>It should be mentioned however, that the monetary authorities impose the upper limit of bank's borrowing from the BoG. This means that this adjustment may not hold for Greece's monetary base. It can hold only if the banks desired borrowing from the BoG is below the fixed upper limit.



5) They are holding reserves as far as it is granted to residents as credit under central bank's regulations. (This item is also added to R when the state's total foreign reserves are measured and for this reason there is no need to adjust MB for the banks' net foreign position). From the last two regulations, it is obvious that banks purchase and sell foreign exchange and hold it only temporarily on behalf of the BoG.

The interdependence of MB and the foreign sector is depicted in the following expressions.

The changes in NR ( $\Delta NR$ ) arise from the following components of the balance of payments BP :

- 1) Current account (CA).
- 2) Net capital imports by the government and private sector NKI.
- 3) Changes in the clearing accounts ( $\Delta CLA$ ).
- 4) Net errors and omissions (ERR).

$$\Delta NR = CA + NKI + \Delta CLA + ERR. \quad (4)$$

From the definition of NR from the balance sheet of the BoG we, also, have :

$$\Delta NR = \Delta (FEG + IMF - BLF) \quad (5)$$

Combining the two equations we obtain :

$$\Delta NR = CA + NKI + \Delta CLA + ERR = \Delta (FEG + IMF - BLF) \quad (6)$$

The surplus in the balance of payments is defined as :

$$SBP = R + \Delta ERR + \Delta CLA \quad (7)$$

where  $\Delta$  stands for the sum of the change of the corresponding variables.

The adjusted monetary base can be rewritten as :

$$MB' = SBP - \Delta ERR - \Delta CLA + NG - CB + OI \quad (8)$$

The equation reflects the foreign and domestic

components of the monetary base. Given that the monetary expansion affects the current account and capital imports which determine the balance of payments surplus, the monetary base loses its power as a policy instrument in the hands of the monetary authorities.

The impact of fiscal policy on the monetary base is exerted via the government's budget constraint. To analyse the relationship between fiscal and monetary policy we use the following table which illustrates the balance sheet of the government.

Table III-2

<u>The balance sheet of the government</u>	
[(G-T) : Government's cash flow deficit	CG : Government's borrowing from the BoG.
OAG : Other assets	TRG : Govern. treasury bills held by the banks.
	SGP : Govern. securities held by the non-bank public *.
	CGF: Govern. borrowing from abroad.
	SG : Govern. securities at the BoG.
	OLG : Other liabilities.
	SGP : Govern. securities held by the banks, other than treasury bills.

---

\* This variable consists of bonds which were issued and sold to the non-bank public, also, during the periods 1961-63 and 1966-72. After the 1973 no government bonds were issued due to the high interest rates induced by the inflationary conditions of the period after 1973 and onwards.

---

The following identity is derived from the balance sheet of the Government :

$$[(G-T)+OAG = CG+SG+(TRG+SGB+SGP)+OLG+CGF \quad (9)$$

The government's net borrowing from the BoG is :

$$NGG = \Sigma(G-T) - (TRG + SGB + SGP) + (OG - CGF) \quad (10)$$

where  $OG = OLG - OAG$ .

Equation (10) reflects the institutional arrangements of the country.

The adjusted monetary base becomes :

$$MB' = SBP - \Sigma ERR - \Sigma \Delta CLA + \Sigma(G-T) - (TRG + SGB + SGP) + (OG - CGF) + NP + CB + OI + NP + NPE \quad (11),$$

where  $NPE = FPE - PED$  (=net position of BoG with respect to the public entities).

The last expression shows clearly that the MB is directly influenced by the balance of payments and the government budget constraint. It highlights, also, the interdependence of monetary and fiscal policies including the budgetary policies.

The government's debt identity is given by the following expression :

$$G - T = \Delta CG + \Delta SG + \Delta TRG + \Delta SGB + \Delta SGP + \Delta CGF + \Delta OLG - \Delta OAG \quad (12)$$

Government finances its deficit by borrowing from the central bank, the rest of the banking sector, the public and abroad and by any combination of the above variables. Combining (11) and (12) we can conclude that the government and its deficit affect the movements of the components of the monetary base. This is indicative of the dependence of monetary policies on fiscal ones. Considering also the influence of monetary policies on the components of the balance of payments, the autonomy of the monetary base is further reduced. However, there is a part of the government deficit which is financed through the creation of high powered money ( $CG + SG$ ) by the monetary authorities. If this fraction of government



debt can be considered as a policy determined variable in the hands of the monetary authorities, then the independence of monetary authorities is reinforced. To this we should add that according to expressions (8) and (11), there exist other components (IBP) affected directly by the actions of monetary policy.

To examine to what extent (and how) government borrowing impairs the autonomy of monetary policies, the balance sheet of the commercial banks is represented in Table III-3 and the existing institutional arrangements of the Greek banking system along with the behaviour of commercial banks are analysed in the proceeding paragraphs. It should be mentioned that the formulation of the mathematical expression for the reserve requirements was presented by G.D Demopoulos (1981).

Table III-3  
The balance sheet of Commercial Banks

Assets

RC =	: Banks' currency (CCB)	TD	: Total private
CCB+BD	: and deposits with the		deposit in
	BoG		drachma.
CC	: Loans to the economy	CB	: Banks' total
TRG	: Governmet's treasury		borrowing from
	bills		BoG
SGB	: Govern. securities	DF	: Deposits in
	(other than treasury		foreign exchange.
	bills.	OAC	: Other
OS	: Other securities		liabilities.
FA	: Foreign assets		
OAC	: Other assets		

---

where  $DF = DF^h + DF^f$  (13)

$TRG = TRGL + TRGE$  (14)

$TD = D + T + S + BD$  (15)

$FA = FA^f + FE^h + CF^h$  (16)

$OB = OAC - OLC$  (17)

$DF^h$  : Foreign deposits with banks held by residents.

$DF^f$  : Foreign exchange deposits with banks held by residents.

TRGL : Part of TRG held in accordance with the legal reserve requirements.

TRGE : The rest of TRG, held in excess of the above requirements.

D : Demand deposits with banks held by the non-bank public.

T : Time deposits, held by the non-bank public.

S : Saving deposits, held by the non-bank public.

$FA^f$  : Banks' claims in earning assets on non-residents.

$FE^h$  : Banks' claims in foreign exchange to residents.

$CF^h$  : Credit in foreign exchange to residents.

The balance sheet reflects the identity :

$$R^C + CC + TRG + OS + OB + FA = TD + CB - DF \quad (18).$$


---

B) The characteristics of reserve requirements

According to the Greek authorities the monetary policies adopted so far, had the twofold purpose to allocate national resources to the different sectors of the economy and to stabilize the latter by influencing demand.

The monetary instruments under the control of the monetary authorities are :

- a) Reserves requirements on banks' liabilities and assets.
- b) Fixed interest rates paid on bank credit and deposits.
- c) Credit ceilings.

The introduction of these instruments was argued to be necessary in achieving the following goals :

- a) To allocate financial resources efficiently between the public and private sector.
- b) To provide with the necessary financial funds sectors of the economy of high importance for the development of the economy.
- c) To prevent the financing of sectors or activities characterized by low productivity.

The components of reserve requirements are the primary and secondary reserves. The primary reserves reflect deposits that the banks' must hold with BoG against : a) the banks' private deposit liabilities and b) credit extended by the banks to certain sectors of the economy (which are specified by the monetary authorities).

These institutional arrangements can be further



analysed to reflect the specific arrangements between the BoG and the commercial banks.

a) Commercial banks hold deposits with the BoG at certain percentage of their savings, demand and restricted deposits (held by the public) as non-interest bearing primary reserves.

b) A certain percentage of private savings, time, demand, and restricted deposits has to be deposited by banks with the BoG as interest bearing primary reserves.

c) Interest bearing seasonal primary reserves are held by banks against private savings and demand deposits with BoG.

d) A certain percentage of banks' short-term credit extended to industry and to domestic and import trades is held with BoG as non interest bearing primary reserves.

The monetary authorities, however, permit the banks to withdraw part of their reserves as long as this part finances export and tobacco trades and shipbuilding, medium and long-term credit for investment in plant and equipment and to public enterprises.

Secondary reserves reflect compulsory investment in treasury bills, government bonds, bonds of public enterprises, which correspond to a certain percentage of banks private demand, savings, blocked, time plus three months notice savings deposits. Furthermore, they depend on loans, medium and long run, extended to industry and other enterprises for investment in plant and equipment and to handicraft. These loans should correspond to a fixed (by the authorities) percentage of their total

private deposits. If these requirements are not met by the banks, the difference between the actual credit extended and the fixed requirements is deposited with the BoG in an interest bearing account invested in treasury bills subject to the approval of BoG.

Before representing the above institutional arrangements in a mathematical form some comments on the controls on interest rates and credit as well, should be made ; The monetary authorities determine the interest rates on all types of private total deposits and bank credit. Certain types of investment or activities that are thought to promote economic development are charged with lower loan interest rates than those which are charged on those investment not belonging to the above mentioned category. The fixed by the authorities interest rates apply also to the discount rates at which banks can borrow from the BoG. Credit ceilings are in effect occasionally and apply to the whole or part of the credit extended by the banks on certain categories of credit extended by commercial banks. Credit to export, trade, tobacco trade, handicraft as well, as to medium and long-term credit for investment in plant and equipment is excluded (except in certain cases) from the credit ceilings.

Total requirements reserves (TRR) are the sum of primary  $RR'$  and secondary  $RR''$ . Primary reserves can be presented as the sum of the required non-interest bearing and interest bearing ones bank hold with the BoG against certain types of their private deposit liabilities and the difference between the required

non-interest bearing reserves with BoG against certain types of bank credit and the withdrawn reserves to finance trades of the private sector. (These trades are specified by the monetary authorities). So we have :

$$RR' = r_0 D + r_T T + r_S S + r_B BI + \sum_i r_i L_i - \sum_i r_i L_i \quad (19)$$

where  $r_0$ ,  $r_T$ ,  $r_S$ , are the sum of statutory primary reserves ratios applied to demand (D), time (T), Savings (S), and restricted deposits (BI) respectively. (These ratios include the interest bearing, non interest bearing and seasonal reserve requirements).

L1 = Short-term credit to industry.

L2 = Short-term credit to domestic and import trades.

L3 = Credit to export and tobacco trades and shipuilding.

L4 = Medium and long-term credit for investment in plant and equipment.

L5 = Credit to public enterprises.

$r_i$  = The statutory reserve ratios applied to the corresponding category of credit.

Secondary reserves are represented by :

$$RR'' = (r_{pin} + r_h) TD + r_{dbs} D + r_{ts1} T + r_{dbs} S + r_{ts1} S1 + r_{dbs} BD - (r_h TD + L_{pin} + L_h) \quad (20),$$

where :  $r_i$  = The required secondary reserve ratios held against :

Private demand, savings and restricted deposits,  $r_{dbs}$ .

Private time and 3-month notice savings, deposits (S1),  $r_{ts1}$ .

Total private deposits (TD) for medium and long-term credit to industry and other



enterprises for investment in plant and equipment,  $r_{pin}$ .

Total private deposits for long-term credit to handicraft,  $r_h$ .

$L_{pin}$  = Medium and long-term credit to industry and other enterprises, withdrawn from banks' secondary reserves.

$L_h$  = Credit to handicraft, withdrawn from banks' secondary reserves.

(The ratio  $r_h$  applies to the increment of the banks' total private deposits  $TD - TD_0$ , where  $TD_0$  are deposits as of January 1, 1966).

To see more clearly the connection of budgetary policies and secondary reserve requirements, we proceed as follows.

From the balance sheet of the government we saw that TRG (government's treasury bills, held by banks) constitutes a component which finances the government deficit. TRG can be decomposed into the statutory component TRGL and the nonstatutory component TRGE. Disaggregating TRGL we obtain :

$$\begin{aligned} \text{TRGL} = & r_{dbs} (D+S+BD) + r_{ts1} (T+S_1) + k_1 (r_{pin} Q \\ & - L_{pin}) + k_2 [r_h (TD - TD_0) - L_h] \end{aligned} \quad (21),$$

where :  $k_1$  = The proportion of the excess of the requirements to extend medium and long-term loans to industry (and other enterprises for investment in plants and equipment), over the credit actually extended,  $L_{pin}$ , invested in treasury bills.

$k_2$  = The proportion of the excess of the

requiremnets, invested in treasury bills,  
in the case of loans extended to  
handicraft.

According to the above regulations a percentage equal to  $1-k_1$  and  $1-k_2$  is held with the BoG as interest-bearing deposits, in the case of industry and handicraft loans, respectively.

Thus, the stock of statutory banks' interest-bearing deposits with the central bank is given by :

$$DL = (1-K_1)(r_{pin}TD - L_{pin}) + (1-k_2)\{r_h(TD - TD_0) - L_h\} \quad (22)$$

The secondary reserves are also given by :

$$RR'' = TRGL + DL \text{ or}$$

$$RR'' = r_{db,s}(D+S+BD) + r_{ts,1}(T-S_1) + [k_1 + (1-k_1)](r_{pin}TD - L_{pin}) + [k_2 + (1-k_2)][r_h(TD - TD_0) - L_h] \quad (23)$$

which is the same as (20)

The last equation implies that if banks extend credit equal to that percentage of their deposit liabilities required by the authorities then :

$$RR'' = r_{db,s}(D+S+BD) + r_{ts,1}(T-S_1) \quad (24)$$

since  $r_{pin}TD = L_{pin}$  and  $r_h(TD - TD_0) = L_h$

If they decide not to extend credit to finance activities specified by the authorities we have :

$$RR'' = r_{db,s}(D+S+BD) + r_{ts,1}(T+S_1) + (r_{pin} + r_h)TD \quad (25)$$

The last two terms of (23) constitute partly choice variables for the commercial banks. This implies that  $RR''$  is not any more a strong instrument for the monetary athorities. Furthermore, given that the first two terms of (23) represent the percentage of private deposit liabilities that are invested in treasury bills, the monetary base is not any more an exclusive monetary

policy variable but depends closely on the budgetary policy. Since money supply and monetary base reflect changes, also, in the stock of treasury bills, if money supply is considered as a variable affecting aggregate demand, its power to assist in price stability and control demand is reduced due to  $RR''$ .

The distortive implications of the institutional arrangements concerning the  $RR''$  is even more reinforced if we consider that one of the purposes of the  $r_h, r_{pin}$  ratios were to redistribute funds towards sectors of the economy of high importance as far as the economic development is concerned. This means that sectors of the economy which are characterized of high productivity can be deprived of financial resources and on the other hand, these resources can finance government deficits which are due to increased current consumption expenditures.

As G. Demopoulos (1981) has mentioned the Banks' investment in treasury bills is at the monetary authorities discretion. However, in practice the monetary authorities allow banks to invest freely in them. This implies that it is not known, a priori, if the  $RR''$  is an autonomous variable depending exclusively on monetary policies, or on budgetary ones, as well.

Furthermore, according to the authorities policy on treasury bills :

- 1) The central bank has a price support policy on that portions of treasury bills TRG that satisfies reserve requirements against banks's deposit liabilities. This portion of interest bearing TRGL should be considered a



perfect substitute for currency and bank reserves and should be definitely included in the monetary base.

2) The portions of treasury bills that can be used as reserves should be considered only substitutable for banks excess reserves. However, if the central bank stands firm in buying and selling these assets at the announced price, then they should be considered perfect substitutes for base money and hence, they should be part of monetary base. There is of course a transaction cost, if these assets are sold before maturity but in the Greek case this cost is rather negligible.

According to these last arguments treasury bills constitute perfect substitutes for base money and consequently they should form part of the monetary base. However, for including them in the MB we must consider that this kind of support policies and the fact that BoG buy and sells TRG at the announced price are not well specified, which makes it impossible to know if TRG are perfect substitute for base money or not.

### C) The monetary effects of the public sector deficit

Having described the main characteristics of the monetary base and the institutional arrangements of the monetary sector we can proceed by analysing the monetary effects of the public sector deficit. The total increase in the money supply (M2) as a percentage of the total amount at the beginning of the period, was in nominal quantities 147.7 during the period 1974-78 and 146.14 during 1979-83, while during 1969-73 and 1964-68 was 106.5 and 82.52 respectively. This upsurge in the money

supply coincided with large public sector deficits which were financed by the issuing of money (credit from the bank of Greece) and by absorbing private deposits from the rest of the banking system through the issuing of treasury bills. Given the institutional arrangements of the monetary authorities, it is imperative to examine therefore, whether or not the increase in money supply (and to what extent) was due to the financing of the government deficit or to the private and foreign sector.

The causes of the changes in the supply of money can be examined analytically by a method which can trace the sources of it. These sources belong to two categories : a) Those that create new money and reflect the change in the monetary base and b) those that are due to the creation of liquid assets through the banking system with the familiar process of deposits-credit and reflect the changes in the multiplier of the monetary base. According to this method the changes in the money supply have 10 sources, 8 individually acting and 2 which are due to the interaction of the other eight.

From these eight sources the four affect exclusively the creation of new money from the BOG and lead to changes in the circulated notes and coins and liquid assets or rearrangements of deposits of commercial banks and specialized credit institutions. These lead directly to changes in the monetary base. The rest four sources affect exclusively the rate of producing new liquid assets by the banking system. Given the monetary base of the economy, this factor determines the final quantity of money supply and consequently its rate of change.



The four sources that affect the liquidity of the economy and cause the change in the monetary base are :

a) The foreign sector of the monetary base which is represented by the net position in foreign currency of the BoG and it is simply the difference between international reserves, in the balance sheet of BoG, minus its liabilities.

b) the public sector source of the monetary base, which is the net position of the BoG against the public sector and it is defined as the difference between the new loans to the public sector and the new deposits of it.

c) The private sector factor of the monetary base which is expressed by the net position of the BoG against the private sector and it is calculated as the difference between the new credit to the private sector from the financial assets of the central bank and the private deposits with the bank.

d) Other unspecified factors.

The other four sources of liquidity which act through the rate of production of new liquid assets by the banking system with the process deposit-credit are :

a) The ratio of liquidity of the public ; the ratio of the holdings in coins and banknotes of the public to the demand deposits, b) the structural ratio of deposits ; the ratio of the sum of private savings and time deposits to the demand deposits.

c) The percentage of the total reserves of the banking system ; the ratio of total reserve requirements to the sum of demand, saving and time private deposits.

d) the percentage of interest bearing bills to the sum



of private demand, saving and time deposits.

(All these ratios constitute the components of the money multiplier).

The following table shows the percentage changes of the monetary base and the sources that cause these changes every five years for the period 1959-1983.

Table III- 4  
Changes in the Monetary Base & their Sources

Period	$\frac{\Delta MB_t}{MB_0}$	$\frac{\Delta NR_t}{MB_0}$	$\frac{\Delta NG_t}{MB_0}$	$\frac{\Delta NP_t}{MB_0}$	$\frac{\Delta A_t}{MB_0}$
1959-63	68.87	17.56	20.13	18.83	12.36
1964-68	69.17	7.09	29.99	33.85	- 1.74
1969-73	86.38	50.51	27.98	47.58	- 39.68
1974-78	115.52	12.79	90.97	-14.17	25.94
1979-83	160.48	26.34	289.37	8.78	-164.35

Source: Monthly statistical bulletins of the Bank of Greece. Author's calculations.

where NR = The foreign sector component.

NG = The government sector component.

NP = The private sector component.

The formula for the calculation of the rates of change of the monetary base and its components is given by :

$$\Delta MB_t = \frac{\Delta NR_t}{NR_0} \frac{NR_0}{MB_0} + \frac{\Delta NG_t}{NG_0} \frac{NG_0}{MB_0} + \frac{\Delta NP_t}{NP_0} \frac{NP_0}{MB_0} + \frac{\Delta AT}{A_0} \frac{A_0}{MB_0}$$

where A stands for the other unspecified factors (it includes OI i.e other items, from the balance sheet of the BoG). From Table III-4 we can see that the contribution of each component of the monetary base on

its change was of different strength through the years. The contribution of the foreign sector was small relative to the other factors, except for the period 1969-73. What is more important is the fact that after the year 1974 the public sector contributed greatly to the increase in the monetary base, while the role of the private sector was diminished.

Table III-5 shows the changes in the money multipliers according to their components, every five years, for the period 1959-1983.

Table III- 5  
Changes in the Money Multipliers & their Components

Period	Total change of the multip lier	Part of the change Of m1/m2 due to :				
		C'	t	trr	trb	ut
-----	-----	-----	-----	-----	-----	-----
	$m_1$					
1959-63	7.16	-1.74	-5.02	18.29	-0.05	-4.31
-----	-----	-----	-----	-----	-----	-----
1964-68	5.11	0.75	-3.71	-2.96	2.50	0.19
-----	-----	-----	-----	-----	-----	-----
1969-73	2.02	1.93	-0.61	-14.32	15.26	-0.23
-----	-----	-----	-----	-----	-----	-----
1974-78	-4.86	0.88	-3.68	-81.08	28.18	0.84
-----	-----	-----	-----	-----	-----	-----
1979-83	-22.16	-1.42	-4.01	-24.26	1.62	5.9
-----	-----	-----	-----	-----	-----	-----
	$m_2$					
1959-63	24.76	-7.54	13.27	18.29	-0.05	0.78
-----	-----	-----	-----	-----	-----	-----
1964-68	7.88	-3.86	10.77	-2.96	2.50	1.44
-----	-----	-----	-----	-----	-----	-----
1969-73	10.83	7.97	2.08	-14.32	15.26	-0.15
-----	-----	-----	-----	-----	-----	-----
1974-78	14.95	5.51	10.10	-31.08	28.18	2.25
-----	-----	-----	-----	-----	-----	-----
1979-83	-5.5	11.07	4.09	-24.26	1.62	1.98
-----	-----	-----	-----	-----	-----	-----

Source: Monthly statistical bulletins of the Bank of Greece. Author's calculations.

The percentage changes in the multipliers according to the factors that caused them are given by the following

expressions (see Papadakis 1979)

$$\frac{\Delta m_1}{m_1} = \frac{1-m_1}{1+c'} \Delta c' - \frac{rm_1}{1+c'} \Delta t - \frac{(1+t)m_1}{1-c'} \Delta r \quad (27)$$

$$\frac{\Delta m_2}{m_2} = \frac{1-m_2}{1+c'+t} \Delta c' + \frac{1-rm_2}{1+c'+t} \Delta t - \frac{(1+t)m_2}{1+c'+t} \Delta r \quad (28)$$

where  $c'$  = The ratio of public's holdings of currency to the demand deposits.

$t$  = The ratio of savings plus time deposits to the demand deposits.

$r$  = The ratio of available reserves to the sum of demand saving and time deposits.

These relationships were derived from the definitions of the money supply :

$$M1 = m_1 MB \quad (29)$$

$$M2 = m_2 MB \quad (30)$$

$$\text{where } MB = C' + RC \quad (31)$$

$$M1 = C' + D \quad (32)$$

$$M2 = C' + D + S + T \quad (33)$$

$C'$  = The currency outside the banking sector.

$RC$  = The reserves of the banks (=CCB+BD)<sup>1</sup>.

so we have :

$$m_1 = \frac{C' + D}{C' + RC} \quad (33) \quad m_2 = \frac{C' + D + T + S}{C' + RC} \quad (34)$$

dividing both (33), (34) by D we have :

---

<sup>1</sup>The term CCB has been calculated as the difference between the currency outside the Bank of Greece and the currency outside the banking system.



$$m_1 = \frac{1+c'}{c'+r(1+t)} \quad (35) \quad m_2 = \frac{1+c'+t}{c'+r(1+t)} \quad (36)$$

Expressing them in terms of growth rates we obtaine equations (27) and (28).

The term RC has been calculated as the sum of currency remaining in the banking system (CCB) and the deposits of commercial banks and specilized credit institutions, with the BoG. If we add the treasury bills trb held by all the banks, we obtain the total reserve requirements of the banking system (trr). so we have :

$$trr = rc+trb \quad (37) \quad \text{or} \quad rc=tr-trb \quad (38)$$

combining (38), (39), (36) and substituting into (27) and (28) we have :

$$\frac{\Delta m_1}{m_1} = \frac{1-m_1}{1+c'} \Delta c' - \frac{rm_1}{1+c'} \Delta t - \frac{(1+t)m_1}{1-c'} \Delta trr + \frac{(1+t)m_1}{1+c'} \Delta trb \quad (39)$$

$$\frac{\Delta m_2}{m_2} = \frac{1-m_2}{1+c'+t} \Delta c' + \frac{1-rm_2}{1+c'+t} \Delta t - \frac{(1+t)m_2}{1+c'+t} \Delta trr + \frac{(1+t)m_2}{1+c'+t} \Delta trb$$

(40)

where : trr = the ratio of total reserve requirements to total private deposits of the banking system.

trb = The ratio of treasury bills to total private deposits of the banking system.

From the table III-5, we can see that the issue of treasury bills which financed the government deficit had a positive effect on the multipliers especially during the period 1969-78. This increase in treasury bills

offset greatly the negative effect on the multiplier due to the increase in total reserve requirements. On the other hand the increase in trb during the period 1979-83 was very small. The importance of treasury bills and total reserves requirements outweighed the contribution of the other factors to the changes of the multipliers, especially after the year 1969.

The following table analyses the changes in money supply and the factors that contributed to these changes.

Table III- 6  
Changes in Money Supply and their Sources

Period	Total change in the money supply	Part of the change due to :		
		The multi plier	The monetary base	residual
	M1			
1959-63	80.96	7.16	68.87	4.93
-----	-----	-----	-----	-----
1964-68	60.54	-5.11	69.18	-3.53
-----	-----	-----	-----	-----
1969-73	90.15	2.02	86.38	1.74
-----	-----	-----	-----	-----
1974-78	105.06	4.86	115.52	-5.61
-----	-----	-----	-----	-----
1979-83	102.75	-22.16	160.48	-35.57
-----	-----	-----	-----	-----
	M2			
1959-63	110.68	24.76	68.87	17.05
-----	-----	-----	-----	-----
1964-68	82.52	7.88	69.18	5.45
-----	-----	-----	-----	-----
1969-73	106.56	10.83	86.38	9.35
-----	-----	-----	-----	-----
1974-78	147.75	14.95	115.52	17.27
-----	-----	-----	-----	-----
1979-83	146.14	-5.50	160.48	-8.33
-----	-----	-----	-----	-----

Source: Monthly statistical bulletins of the Bank of Greece. Author's calculations.

Table III-6 shows clearly that the monetary base was the main factor which contributed (positively) to

the changes in the money supply. The banking system through its influence with the multiplier was unable to offset the influence of the monetary base.

The analysis can be completed with the following tables which show the changes of all the factors that contributed to the changes in money supply expressed as a percentage of the total change of it.

Table III-7  
Percentage Changes of M1 components

Total change in M1	1959-63 : 100%	1964-68 100%	1969-73 100%	1974-78 100%	1979-83 100%
Change due to :					
The public sector	24.9	49.6	31	86.5	281.16
-----	-----	-----	-----	-----	-----
Private sector	23.3	55.9	52.8	-13.5	8.5
-----	-----	-----	-----	-----	-----
Foreign sector	21.7	11.7	56	12.2	25.6
-----	-----	-----	-----	-----	-----
Other factors	0.2	-2.9	-44	24.7	-160.9
-----	-----	-----	-----	-----	-----
c'	-2.16	-1.23	2.1	0.83	-1.37
-----	-----	-----	-----	-----	-----
t	-6.19	-6.1	-1.3	-3.5	-3.9
-----	-----	-----	-----	-----	-----
trr	22.6	-4.9	-15.6	-29.5	-23.5
-----	-----	-----	-----	-----	-----
trb	-0.1	4.1	16.6	26.8	1.6
-----	-----	-----	-----	-----	-----
Interrelation of the above factors	-21.1	6.2	-2.4	4.5	33.3

Source: Monthly statistical bulletins of the Bank of Greece. Author's calculations.

The tables shows clearly that the public sector was the main source of the increase in money supply after the year 1974, while the role of the private sector was



Table III-8  
Percentage Changes of M2 components

Total change in M2	1959-63 : 100%	1964-68 100%	1969-73 100%	1974-78 100%	1979-83 100%
Change due to :					
The public sector	18.18	41	26.23	61.9	197.9
-----	-----	-----	-----	-----	-----
Private sector	17	49	44.6	-9.6	5.9
-----	-----	-----	-----	-----	-----
Foreign sector	15.9	8.6	47.4	8.7	18
-----	-----	-----	-----	-----	-----
Other factors	11.2	-2.1	-37.2	17.6	-112.4
-----	-----	-----	-----	-----	-----
c'	-6.8	-4.7	7.5	4.8	7.6
-----	-----	-----	-----	-----	-----
t	1.2	13	2	8.8	2.8
-----	-----	-----	-----	-----	-----
trr	16.5	-3.6	-13.4	-27.1	-23.7
-----	-----	-----	-----	-----	-----
trb	-0.04	3.01	14.3	24.5	1.1
-----	-----	-----	-----	-----	-----
Interrelation of the above factors	-26.9	-3.8	-8.6	- 10.7	-2.8

Source: Monthly statistical bulletins of the Bank of Greece. Author's calculations.

decreased. Furthermore, the private sector was provided by less funds through the creation of new money by the banking system as the increases in total reserve requirements show<sup>2</sup>.

#### E) Conclusion

The preceding analysis showed clearly that the monetary base of the Greek economy depends on the budgetary policy and thus, it cannot be regarded as an exclusive monetary policy instrument. The money supply

---

<sup>2</sup>The ratio of total reserve requirements shows the percentage of the total deposits which is not extended as credit to the non-bank public.

and the monetary base are affected strongly by the treasury bills of the government through the institutional arrangements of the secondary reserves requirements. Since there is an immediated effect of an increase in the fiscal deficit on the money supply either through the increase in treasury bills or through the increase in high powered money the monetary authorities cannot act independently from the fiscal policies to assist in price stability, especially in inflationary periods. The institutional arrangements of the total reserves of the Commercial banks can become very distortive since they give the opportunity to the banks to invest in treasury bills and thus, sectors of the economy can be deprived of financial resources, especially when credit ceilings are imposed. Finally the complexity of the arrangements as far as the secondary reserves are concerned makes it quite difficult for someone to examine empirically the extent to which the secondary reserves depend on the monetary or budgetary policies.

The examination of the factors that affected the changes in the money supply proved that the monetary base contributed greatly to that change. On the other hand, the increase in monetary base, after 1974, was due, mainly, to the public sector deficit. Furthermore, a considerable amount of financial resources were tranferred from the private to the public sector, especially during the period 1969-78, via the investment of the banks in treasury bills.

## CHAPTER IV

Estimates of Summary measures of fiscal influence for  
Greece

---

A) Problems arising from estimating the FES

The differences in the economic environment between developed and developing countries give ground for some alterations in the summary measures of fiscal stance. The role of stabilization policy focuses on promoting orderly adjustments to structural imbalances without sacrificing the momentum of growth. The stabilization policy can be used to minimize unemployment, and control inflation, assuring at the same time a stable level of absorption (consumption+investment). Full employment output is very difficult to define since resources are frequently underutilized due to the presence of severe structural bottlenecks. This implies that stabilization policy cannot be defined as the policy which tries to bring actual output at potential output level. Given the dependence of LDC's on such factors as imports, increases in aggregate demand have an immediate effect on imports and inflation. Stabilization policy could be defined as that which tries to moderate the effects of variations in real income on absorption and inflation. Stabilizing absorption is important both because of its direct welfare connotations and its implications for the medium-term growth of aggregate supply. It is a fact



that real income fluctuations have a disruptive effect on investment (especially in LDC's).

The summary measures do not distinguish between consumption and investment. They simply assume that balance between consumption and investment is maintained for promoting growth. Stabilization can be accomplished through several means; e.g. through increases in government expenditure either on government's own account or by means of higher transfers. However, this procedure depends on a country's international reserves and the availability of international credit. If reserves are adequate, it will be possible to maintain absorption while minimizing inflationary pressures. Thus, if the objective in LDC's is to minimize fluctuations in absorption, the summary measure for fiscal stance can be used by replacing potential output and using trend income instead.

In order to calculate a measure of fiscal stance for Greece, it would be useful to see the main principles of Full Employment Surplus, how it is calculated and the difficulties in applying such a method to the Greek case.

The F.E.S is an estimate of what the surplus would be if the economy were operating along the path of its potential GDP. F.E.S is the mirror image of the excess of private investment over private saving required to achieve equilibrium at full employment. In other words F.E.S represents the amount of government saving that will be generated at full employment with stable prices. It reflects the full restrictive impact of the built in

stabilizers at a high non-inflationary level of economic activity. Potential GNP at stable prices can be reached and retained, if the full employment surplus is exactly equal to the excess of private full employment investment over full employment savings. For any utilization target, the choice of a larger average surplus over the long-run requires a more expansionary monetary policy, and implies a desire to shift resources into housebuilding and other investment, through the mechanism of private markets. Estimates of the F.E.S (especially the short-run ones) involve three stages<sup>1</sup>:

- a) Estimating the level of full-employment or potential GNP.
- b) Calculating built-in nondiscretionary revenues and expenditures, on the one hand and discretionary, on the other.
- c) Estimating the full-employment levels of the built-in non-discretionary budget receipts and expenditures and adding them to the discretionary ones.

The meanings of potential output GNP and full employment GNP are synonymous. Potential GNP is the GNP which can be produced with the best available techniques, least cost combinations of inputs, utilization rates of both capital and labor, indicated by the full employment norms of the economy, and all these under a

---

<sup>1</sup>Many conceptual and estimating problems have not yet been resolved and a set of generally accepted estimates of potential GNP does not exist.



non inflationary environment. What we need for the estimation of potential GNP are: data for the available full employment inputs, market prices, production functions and the shifts of them over time. However, the measure of potential GNP used, for the Developed Countries, is the GNP consistent with a certain percentage unemployment in any year, given the techniques, factor combinations, hours of work prevailing at the time with "full employment".

Potential GNP at any year should be the sum of : (a) the actual output, (b) the additional output that could be achieved if all factors of production were fully employed and (c) the further additional output that could result from greater efficiency of both capital and labor. It should be mentioned here some aspects which concern the short-term and long-term potential output. For a short-term analysis the quality and quantity of available inputs and their norms of full utilization can be taken as "given data" , and technological change is of relatively minor importance. A short-term estimate of potential GNP is the sum of actual GNP and that loss of GNP attributable to intracyclical and erratic fluctuations. On the contrary, technological changes are major determinants of the growth potential of the economy. Availability of inputs and their utilization rates, increases in productivity with temporary fluctuations of GNP determine the potential GNP in long-run. The long-run potential GNP simply measures the secular production relationships.

The problems arising from calculating potential



output (especially for a developing country) can be clearly understood by looking at the methods already used to estimate potential output :

a) Production function method

This can be the most satisfactory one from the point of view of the concept of potential GNP itself. The difficulties of estimating empirically the potential GNP are the major drawbacks. An econometric model is needed for at least the two major inputs labor and capital. Reliable data concerning a long time period are essential for reliable estimates.

b) Truncated production function method

It relates labor force utilization and productivity to total output. According to this, short-term potential GNP depends on, (1) increases in average work hours, (2) increases in labor force participation, (3) increases in man-hour productivity. According to this method, the three influences, mentioned above, are closely related to the unemployment rate.

c) Growth rate extrapolation method

This is the simplest method. It assumes that real potential GNP grows at a constant rate in the long-run, or at least in a period of good many years. Obviously the growth rate extrapolation method leaves room for several competing estimates of potential output.

d) Linked-peaks method

It selects two peak levels of economic activity that represent full employment and full resource utilization and connects them by means of a semi-logarithmic straight line. Then, when these peak

values of GNP are plotted on a semilogarithmic chart, the connecting line segment is viewed as the growth path of potential GNP, implying a constant rate of growth from the earlier to the later peak. The drawbacks are focused on the selection of peaks. The peaks selected are likely to differ somewhat with regard to the rate of resource utilization. Current GNP data are subject to some estimating errors. This means that one GNP peak may be somewhat too low relative to the other as a measure of realized economic potential.

All the above mentioned methods with their drawbacks seem to satisfy the use of the trend GNP for an estimate similar to F.E.S .

Full employment revenues are calculated by applying the prevailing tax laws to the income shares (personal income and corporate profits), estimated on the basis of potential output. All government receipts are treated as part of the non-discretionary built in stabilizers which depend to a large extent on the level of GNP.

The full employment expenditures are the actual expenditures adjusted for the unemployment compensation benefits, to reflect the level of the latter at the target unemployment rate, which is consistent with full employment. All the other levels of expenditure are considered to reflect discretionary decisions of the government. Potential expenditures are equated with actual spending, thus disregarding secular trends in government expenditure. The use of all expenditures as discretionary reflect the limited knowledge of their behaviour. Expenditures are determined by budget



programs that represent commitments for expenditures over a period of several fiscal years. This highlights the fact that government spending at a given year follows the initiation of a specific program, and it can be regarded as non-discretionary, in the sense that new legislation is required to actually modify the particular expenditure. For example the budget may turn to a deficit from one year to the next because of increased spending for farm price support. There is an obvious confusion whether the decline in the budget surplus should be considered discretionary or built in and non-discretionary.

Two methods of estimating potential revenues have been widely used :

1) The first method requires major relevant income components, (corporate profits and personal income), to be derived from potential GNP and to estimate, in turn, the full employment level of each of the major source of revenue (corporation income tax, individual income tax, etc.).

2) The second method computes a single coefficient of the built in stabilizers, which relates intra-cyclical changes in GNP to changes in total revenues. The F.E.S is then calculated by multiplying the GNP gap (the difference between potential and actual GNP) by the intracyclical coefficient of the built in stabilizers and this product is added to the actual budget surplus.

Although the first method is more detailed and sophisticated, it suffers from the following drawbacks :



a) Each income component must first be estimated from potential GNP. This implies that they should be estimated as a fixed constant percent of potential output.

b) The method relates levels of revenue to levels of GNP and this means that the coefficients used for estimating potential revenues should be secular , rather than intracyclical ones. Using short historical series to estimate the coefficients implies estimates of intracyclical rather than trend relationships. Intracyclical coefficients are the relevant one for the the method (II).

For the calculation of full employment revenue the biggest source of uncertainty in the revenue estimation concerns the uncertainty of the magnitude of corporate profits. The importance of the magnitude of the latter arises from the fact that the tax rate on corporate profits is much higher than typical rates on personal income. This means that a shift of one dollar from personal income to corporate profit adds more to revenue than if the opposite had happened. Decisions about what is to be reflected in the difference between actual and full employment must rest on the following rule. Any full employment surplus calculation should take into account secular and structural changes in the economy. Any long-term changes in the composition of demand between corporate and non-corporate output, in the relative returns to capital and labor should influence the estimate of F.E profits and the resulting taxes. However shifts in aggregate private demand and

accompanying cyclical changes in price cost relationships and in productivity should not affect the F.E profits estimate. According to this, deviations from normal in the inventory valuation adjustment <sup>2</sup> will show up as part of the automatic stabilising gap between actual and full employment federal revenues. Furthermore, it is a fact that the level of profits depends on the rate of increase of GNP as well as on its level and its relation to potential. The calculation of F.E revenues is based on the level of corporate profits when the economy is travelling along a full employment path, for at least a couple of quarters. The difference between actual and full employment revenues will depend on the current and very recent speed of economic advance, as well as on the size of the gap between actual and potential GNP. This strategy is satisfactory since automatic fiscal stabilization does depend on the speed as well as on the level of economy. These considerations lead researchers to calculate full employment revenues by multiplying a marginal federal fiscal coefficient by the GNP gap to give a measure of the surplus gap. This kind of treatment of revenues is adequate when there is not an abnormally large inventory valuation adjustment and a large rate of change in profits which can reinforce instead of offsetting each other. If this is true, then the surplus computation

---

<sup>2</sup>Capital gains on business inventories are excluded from the national income accountant's concept of profits but they are included to a large extent in the tax base.



could differ significantly from estimates based on levels. To see the working of this we can consider the following example. In 1969, the USA's actual and potential output were identical. Corporate profits (including the inventory valuation adjustment) were 1% below the estimate of the normal F.E ratio and depressed actual revenues. However, the totals of full employment and actual revenues were mainly identical, the main offsetting factor was the very large size of the inventory valuation adjustment.

Shifts in corporate interest payments which are the result of aggregate demand and monetary influences and which are bound to be long lived can be built into the estimate of F.E. profits. The same applies to structural shifts in the, a) profit shares in the GNP and to shifts away from profits which add to the after tax private incomes, and b) distribution of income between corporate and non-corporate sector (because of the differential in tax rates). The latter may be very important for the calculation of F.E.S even with the same tax rates, since, at least in the short-run, the marginal propensity to spend out of personal disposable income is higher than the corresponding one out of the corporate income.

For the F.E.S the GNP deflator is used to convert potential GNP into current dollars. Actual prices are thus incorporated into the calculation of the F.E.S, and no allowance is made for automatic stabilising revenue gains, due to the price increases. However, an understatement of fiscal stimulus may arise because,



when actual output exceeds potential and prices are increasing, actual revenues are increased, due to increases in real income and inflation. The part of revenue due to extra real output represents the automatic stabilising element in the actual budget, the extra revenue due to price increases are, however added to the full employment revenue. If the impact of higher prices on expenditures is not prompt or as automatic as on revenues, the fiscal policy seems more restrictive ex-post than ex-ante (because autonomous private demand or monetaty policy shifted into higher gear or because the budget was inappropriately expansionary). This gives ground for adjustment for inflation. The problem is that there is no clear evidence of what kind of adjustment is the appropriate one. This problem is due to the fact that the bulge in prices and in output is different. For example, a boom shifts both output and prices above their paths. When the boom ends and output returns to its potential level, the old path can be used for the calculation of potential output. On the contrary, if the rate of inflation comes back to its normal path, the level of prices will not role back because excess demand is eliminated. It will stay above the old path. This fact makes it unsatisfactory to draw a "normal path" of prices and to stick on that path for calculating full employment revenues. Further a rollback of the price level is not considered by any government as a desirable or feasible objective. The aim is to restore a tolerable rate of price increases rather than to return to any particular target price path. Thus the F.E.S estimation

should be consistent with the facts which in turn, are reflected in economic policy decisions.

A further problem arises if we consider that certain government expenditures will respond more or less quickly to inflation. If expenditures are adjusted downwards to exclude such inflation-induced outlays, the F.E.S will be a less unrealistic measure of fiscal stance. The conclusion from the above remarks is that at some point the real behaviour of the prices must be reflected in the calculation of the F.E.S. This may not be relevant for a short period of time estimation, but it is when estimations over a long-time period are considered. If the price path for the calculation of full employment revenues can be set forth a year in advance, the calculation is made independent of economic activity. For that reason, all the drawbacks of using current period deflators are eliminated. In a boom year the extra revenues due to output and price increases are considered both as the result of automatic stabilizers, which make the actual surplus to exceed the F.E.S. On the other hand, if current deflators are used, instead only the part of revenue due to real output increase is considered as the result of the automatic stabilizers. The price increase is added to the F.E revenues, as the the F.E. non-discretionary part of revenues, which is added to the discretionary ones.

Another problem with prices arises because of the momentum they display during their pace of advance. Even when excess demand is eliminated the rate of increase in prices continues to be above normal for some time. If we



use a rule that defines normal prices of the current year as last year's actual prices marked up by the long-run normal rate of upward creep in prices, this rule will produce a small deflator. On the other hand, if the calculation of F.E. revenues is based on the continuation of the past year's inflationary rate of increase, we assume no slowdown of prices. This rule will produce an implausibly high deflator.

The problem with the deflator can be seen clearly if we consider the following. If in a given year called zero, actual output matches potential and prices creep upwards at their normal rate, the actual budget can be balanced and F.E.S. is zero. If in year one, demand surges, real output increases and prices increase more than the normal rate. If expenditures are unaffected a surplus emerges. If F.E.S. is calculated using the current year's price increase, not the normal one, it would yield a positive number, since the increase in prices is folded into the revenues. If we had used the normal path for prices F.E.S. would be zero again. It seems reasonable, thus, to use the normal path. However, in year two, output returns to its potential path and prices continue to increase. If we calculate F.E. revenues using the normal path of prices and expenditures are equal to the F.E. revenues, we have a zero F.E.S. Given this level of expenditures, however the actual revenue will increase more than the F.E. revenues since the actual prices increase more than the normal. Thus, we have zero F.E.S. and an actual budget surplus when potential output has been realized. This



means that private investment has to exceed private saving for full employment to be achieved, even though the F.E.S is supposed to be zero.

The following formula was proposed by A. M. Okun and N.H. Teeters (1974), for the calculation of the potenial GNP deflator :

$$P_t = P_{t-1} / 2 [ ( 1+r ) + ( P_{t-1} / P_{t-2} ) ]$$

where  $r$  is the normal price increase.

The formula allows for disinflation over a year's period, that brings the trend of price increases half way back to the normal rate. However, the formula is to be used only when low inflation rates are realized.

For a mathematical presentation of the estimation of F.E.S. we can use the following relationships.

1) Estimates based on levels, revenue components and GNP derived components.

$$R = R_1 + R_2 + \dots + R_n. \quad (1)$$

$$Y = Y_1 + Y_2 + \dots + Y_n. \quad (2)$$

$$E_p = E_a. \quad (3)$$

$$S = R - E. \quad (4)$$

$$S_p = R_p - E_a. \quad (5)$$

$$Y_j = f(\text{GNP}). \quad (6)$$

$$R_i = r(Y_j). \quad (7)$$

where :

$R$ =government revenues, and  $R_i$ =revenue components.

$E$ =government expenditures.

$S$ =budget surplus.

$Y_j$ = GNP derived components by major relevant categories.

$g$ =gap value i.e., potential value-actual value.

p=potential value.

a=actual value.

If we want to calculate the surplus over a long time period we can replace eq. (3) with eq. (8).

$$E_k = e(GNP_p) \quad (8)$$

where  $E_k$ =components of goverment expenditures.

Assuming linear relationships we have the following expressions :

$$Y_j = f_o + f_j GNP \quad (6)'$$

$$R_i = r_o + r_i Y_j \quad (7)'$$

$$E_k = e_o + e_k GNP \quad (8)'$$

To estimate regressions like (6)', (7)', (8)', potential values for the corresponding variables should be used. However, given that the occurrence of actual GNP levels equal to their potential ones does not happen quite often to enable us to obtain potential output levels as well as potential levels of  $Y_j$ ,  $R_i$ ,  $E_k$ ,<sup>3</sup> for a time period long enough in order to estimate the above mentioned equations, actual values can be used. Using actual data, thus, we will obtain intracyclical and secular relationships. If the period in examination is too long, this kind of estimation is considered reliable for secular estimates of budget surlpuses or deficits. In this case  $f_j$  and  $e_k$  are secular coeficients, and  $r_i$

---

<sup>3</sup>The potential levels are simply the realized levels of the variables when actual GNP equals its potential level.

are the built in stabilizers.

2) Estimates based on levels, revenue components and potential output

According to this method (7)' can be modified by using GNP for each of the  $Y_j$ 's, so we have :

$$R_i = r_0 + r_k \text{ GNP} \quad (7)''$$

If we estimate (7)'', then we know the values of  $r_0$  and  $r_k$  and in turn, we can estimate  $R_{ip} = r_0 + r_k \text{ GNP}_p$

3) Estimates based on increments, revenue gap and GNP gap

For this method the relations which can be used are :

$$R_p = R_a + R_g \quad (9)$$

$$E_p = E_a \quad (10)$$

$$S_p = S_a + R_g \quad (11)$$

$$\Delta R = F(\Delta \text{GNP}) \quad (12)$$

$$R_g = F(\text{GNP}_g) \quad (13)$$

The intracyclical coefficient of the built in stabilizers may be estimated from :  $\Delta R = R_0 + R_1(\Delta \text{GNP})$

If the time unit is short (one quarter) the coefficient  $R_1$  will be an intracyclical (incremental) coefficient of the built in stabilizers reasonably free of secular influences and they can be applied to the instantaneous gap relationship  $R'_g = R_0 + R_1 \text{GNP}_g$ .

The higher the F.E.S the more restrictive the fiscal policy is. When we want to compare two alternative fiscal programs applying in a future period we can use the actual level of F.E.S. However, for comparisons over a great number of years, we can use the percentage ratio of F.E.S to potential GNP, since this



ratio takes into account the increasing size of the economy. Any shift in fiscal policy (either towards a constraint or expansion) should be assessed by taking into account the current and expected target and levels of economic activity and monetary policy.

As a general conclusion we could say that :

1) Present estimates of F.E.S are unreliable with regard to the level of size of the surplus. This means that the size of the F.E.S should be used as the basis for those analysis or policy decisions that would not be affected significantly by a margin of error of the surplus, amounting to several billion dollars.

2) Present estimates of the full employment budget surplus are fairly reliable indications of the direction and general order of magnitude of changes in the surplus over time.

#### B) Estimates of the structural deficit for Greece

To estimate a structural deficit for Greece, we will produce what the deficit should have been if the economy was operating along its trend GNP.

We calculated trend GNP by using the estimated coefficients of the following regression:

$$\begin{aligned} \text{LGNPR} = & 11.694 - .04 \text{ D75} + (.07062 - .00611 \text{ D7579} \\ & (4.51) \quad (-2.72) \quad (6.85) \quad (-3.31) \\ & - .0114 \text{ D8081} - .0165 \text{ D8283) T} \\ & (-4.37) \quad (-4.88) \end{aligned}$$

$$\bar{R}^2 = 99\% \quad \text{S.E.} = .0128$$

(Figures in parantheses are t-ratios; the equation was estimated by the Non-linear Least Squares method, using annual data covering the period 1960-83).

where LGNPR : the log of GNP at constant prices

- T : time
- D75 : dummy variable taking the value of one in 1975 and zero elsewhere. It was used to take into account the impact of the political transition from dictatorship to democracy on the actual level of GNP.
- D7579 : dummy variable to denote the shift in the growth rate of GNP, due to the first oil crisis and the more severe effects of inflation on GNP. It equals one between 1975 and 1979 and zero elsewhere.
- D8081 : dummy variable taking the value one at 1980 and 1981 and the value of zero elsewhere. It represents the effects on the growth rate of GNP due to the second oil crisis.
- D8283 : dummy variable which represents the effects on the growth rate of GNP of the new socialist government that took office in late 1981. It takes the value of one in 1982 and 1983, and zero elsewhere.

The trend GNP was calculated from the predicted values of that regression, assuming that the effects on the growth rate of the periods 1975-79, and 1980-81 were transitory ones, (or that they do not represent effects endogenous to the Greek economic system). This means that we put a value of zero in the dummies of the

corresponding periods. We hold the dummies for the effects of the socialist government, not to denote that the purpose of the new government was to reduce the GNP, but to state that under the new policies it adopted combined with the psychological effects to the public led to a reduction to GNP. In other words we assume that these effects are endogenous to the system but do not represent discretionary effects of the government. Thus they are considered to have affected the long run rate of growth of GNP. The nominal trend GNP was calculated by taking the antilog of the above mentioned estimate of trend GNP and multiplying it by the GNP deflator.

The tax revenues and government expenditures which correspond to the trend current GNP were calculated, by running regressions using the actual components of tax revenues and expenditures as the dependent variables and the actual nominal GNP level as the explanatory variable. All the variables were in logarithms. Then, from the estimated regressions we calculate the structural tax revenues and expenditures, by replacing the nominal GNP with its trend, and taking the antilogs. The antilogs of the derived levels of taxes and expenditures are assumed to be the trend built-in non discretionary ones, while the antilogs of the residuals from the regressions are the discretionary levels of the expenditures and taxes. This specification was proposed by Lotz (1970).

This method of estimation of structural expenditures and revenues was chosen because the revenue components do not coincide with the GNP income



components in the national accounts. Furthermore, the logarithms of the variables were chosen in order to obtain direct estimates of the built-in elasticities of the taxes and expenditures. Thus it will enable us to calculate the fiscal drag (see Appendix).

The sum of the above mentioned categories of revenues are the structural ones which are deducted from the corresponding structural expenditures to give the structural deficit or surplus. The treatment of government expenditures in this way (= using the trend expenditures, rather than the actual ones) is justified by the fact that we calculate the structural deficit over a long period, which means that we are interested in the secular changes of the expenditures. Using disaggregate data for the calculation of the budget deficit we consider, it is a better approximation of the movements of the deficit since each category of expenditure and revenue move in a different way over the years than their aggregate magnitudes show. It should be mentioned that, since the regression of investment revenues did not fit the data statistically well, as it can be seen from the estimated regression, shown in the appendix, we use the actual levels of this variable for the calculation of the structural deficit. Furthermore, the problems arising from the calculation of corporate taxation do not create a problem for the Greek case, since the revenues from this source are of minor importance as far their magnitude is concerned. <sup>4</sup> This is due to the special treatment they enjoy from the tax legislation, for the promotion of industrial

investments.

Table IV-1 represents the actual deficit and the structural one, as percentages of GNPN and trend nominal GNP respectively.

From now on all the actual and structural concepts of the deficit are going to be expressed as percentages of actual and trend nominal GNP, respectively.

Table IV-1

The structural deficit

Year	DP	DSP	$\Delta$ DP	$\Delta$ DSP	DEFFD
1960	3.82	3.26	-	-	-
1961	2.83	0.87	-.99	-2.38	2.46
1962	3.79	2.65	.96	1.78	0.78
1963	2.20	0.77	-1.59	-1.88	0.18
1964	4.35	3.40	2.14	2.63	3.53
1965	3.74	2.67	-.61	-0.73	7.36
1966	2.79	2.69	-.94	0.02	-2.14
1967	1.12	2.35	-1.63	-0.34	9.47
1968	2.65	3.84	1.53	1.49	-4.67
1969	2.66	3.93	.01	0.10	3.24
1970	2.71	3.80	.05	-0.13	5.12
1971	3.42	4.54	.71	0.75	1.67
1972	3.73	4.84	.31	0.30	17.30
1973	6.03	6.91	2.30	2.07	0.54
1974	5.60	7.60	-.44	0.69	23.57
1975	5.80	6.73	.20	-0.86	19.82
1976	7.60	8.14	1.81	1.41	29.17
1977	6.95	7.65	-.66	-0.49	32.25
1978	5.99	7.10	-.95	-0.55	40.26
1979	7.11	8.59	1.12	1.49	76.12
1980	7.06	7.95	-.05	-0.64	80.75
1981	17.06	19.10	10.01	11.15	174.66
1982	13.33	10.71	-3.33	-8.39	-106.09
1983	11.31	10.25	-2.02	-0.46	135.47

(The last column is in billion drachma).

Source: "The Greek Economy" ed. Bank of Greece and monthly statistical bulletins of the Bank of Greece.

Author's calculations: see Appendix(4)

where, DP is the actual deficit divided by the GNPN, DSP is the structural deficit, divided by trend GNPN,  $\Delta$ DP is

---

<sup>4</sup>The same applies to the reveues from government investment.



the change of DP, while  $\Delta DS$  is the change of DSP. DEFFD is the difference between the change of expenditures and tax revenues over their change which is proportional to the change of trend GNPN. This variable shows that during the period under consideration the change in trend expenditures was higher than the fiscal drag except in three years. Since this does not imply a consistent fiscal drag through the years, there is no need to adjust trend tax revenues for fiscal drag. Furthermore, expenditure was increased in the next years thus compensating for the fiscal drag. Examining the actual budget and the structural ratio after the emergence of the inflationary conditions that is after 1973 we can see clearly that the structural budget was systematically higher up to the year 1981 and lower afterwards than the actual budget ratio. This means that after the first oil crisis contrary to the majority of developed countries (and to the standard macroeconomic theory) which they reduced their deficit or increase their surpluses in Greece the expansionary policy was continued as we had a larger structural deficits than the period before the crisis. The maintainance of high structural deficit ended to an extremelly high peak in 1981 ammounting to the 19% of the trend GNPN compared with a 17% for the actual defcicit ratio. The last two years experienced lower structural deficits in comparison with its peak and the actual ratio. However the structural ratio continued to be higher than the pre 1973 years. From the third and fourth column which show if the actual and structural fiscal deficit were



expansionary or contractionary through the years we can see that after 1972 both the budget concepts coincide as indicators of fiscal stance, except for the 1974 1975. In 1974 and 1975 the structural budget was expansionary and contractionary respectively, while the opposite holds for the change in the actual budget ratio. Both budgets exert a restrictive effect on the economy except the years 1976 1979 and 1981, where their signs are positive, thus indicating an expansionary effect. As far as the previous years are concerned the change in actual deficit fails to indicate its true budget impact on the economy in the years 1966, 1970, as having the opposite of the change in the structural budget.

Table IV-2 shows the actual deficit corrected for the inflation induced depreciation of government debt. The first column represents the actual deficit, DP. D1 is DP corrected for the depreciation of the stock of treasury bills and foreign debt. (According to Buiter (1982) this measures the potentially future or current inflationary pressures). D2 is DP corrected for the depreciation of treasury bills alone. D3 represents the potential crowding out pressures of the deficit financed from borrowing from the commercial banks and foreign banks. D4 measures the crowding out pressures of the deficit financed by the commercial banks alone. D5 is the actual deficit corrected for the depreciation of the government debt as a whole (it includes borrowing from the central bank, commercial banks and foreign banks).

The last two columns show the actual debt service

Table IV-2

Actual deficit corrected for the inflation depreciation of government debt

Year	DP	D1	D2	D3	D4	D5	DBTS	DBTSC
1960	3.82	3.58	3.74	3.49	3.40	3.51	0.55	0.62
1961	2.83	2.72	2.79	2.73	2.15	2.69	0.60	0.63
1962	3.79	3.46	3.66	3.46	3.66	3.39	0.84	0.92
1963	2.20	2.11	2.16	0.54	0.70	2.07	0.99	1.00
1964	4.35	4.06	4.21	4.14	3.59	3.96	0.99	1.00
1965	3.74	3.40	3.58	2.81	2.02	3.29	1.12	1.15
1966	2.79	2.38	2.60	1.37	1.14	2.21	1.20	1.23
1967	1.12	0.90	1.01	-0.15	-0.63	0.79	1.28	1.29
1968	2.65	2.47	2.56	2.33	1.81	2.40	1.50	1.49
1969	2.66	2.30	2.47	-0.09	-0.57	2.10	1.76	1.74
1970	2.71	2.25	2.46	2.94	2.35	2.06	1.99	1.94
1971	3.42	3.02	3.20	3.12	2.66	2.89	2.08	2.03
1972	3.73	3.01	3.31	2.67	1.97	2.81	2.05	1.92
1973	6.03	3.57	4.52	3.88	4.44	3.04	2.01	1.45
1974	5.60	2.42	3.60	2.65	2.55	1.96	2.01	1.21
1975	5.80	5.01	4.54	4.74	1.41	4.75	2.14	0.40
1976	7.60	5.04	5.74	5.24	5.94	4.81	2.22	1.05
1977	6.95	4.34	5.18	4.05	5.09	4.15	2.29	1.37
1978	5.99	3.49	4.08	-2.73	-3.08	2.52	2.42	1.09
1979	7.11	3.74	4.41	3.61	3.08	2.57	2.95	0.91
1980	7.06	4.64	4.42	4.29	2.23	3.63	3.07	0.21
1981	17.06	14.65	14.30	10.65	7.80	12.97	3.45	0.33
1982	13.33	9.77	9.91	6.79	5.64	7.34	3.52	0.24
1983	11.31	10.24	8.87	10.06	8.53	8.61	4.26	0.44

Source: "The Greek Economy" ed. Bank of Greece and monthly statistical bulletins of the Bank of Greece. Author's calculations

(DBTS) expenditures and the inflation corrected ones

(DBTSC) respectively.

For the calculation of the above variables the following mathematical expressions were used :

All the variables below are expressed as percentages of GNP.

LG=the government debt.

TR=stock of treasury bills.

CL=debt with the bank of Greece.

FL=foreign debt.

DP1=DP, including only DBTS paid in drachma.

LG=TR+CL+FL.

$D1 = DP - \pi(TR) - (\pi - e)FL$ .

Table IV-3Structural deficit corrected for inflation depreciation of government debt

Year	DS	DSN	DS1	DS2	DS3	DS4
1960	3.26	2.45	3.20	2.72	3.12	2.64
1961	.87	-0.07	0.74	0.32	0.75	0.33
1962	2.65	1.32	2.32	1.82	2.32	1.82
1963	.77	-0.39	0.67	0.35	-0.88	-1.20
1964	3.40	2.36	3.40	2.95	3.48	3.03
1965	2.67	1.44	2.68	2.15	2.07	1.55
1966	2.69	1.44	2.72	2.17	1.71	1.15
1967	2.35	1.03	2.33	1.87	1.29	0.83
1968	3.84	2.33	3.78	3.34	3.65	3.20
1969	3.93	2.36	4.07	3.53	1.66	1.12
1970	3.80	2.19	4.09	3.48	4.79	4.19
1971	4.54	2.96	4.91	4.34	5.01	4.44
1972	4.84	3.30	5.11	4.38	4.76	4.03
1973	6.91	5.30	6.58	5.24	6.90	5.56
1974	7.60	5.68	6.56	5.10	6.78	5.32
1975	6.73	4.54	4.74	4.70	4.49	4.44
1976	8.14	5.83	6.40	5.38	6.58	5.56
1977	7.65	5.10	5.75	4.70	5.50	4.45
1978	7.10	4.30	4.64	3.82	-0.76	-1.58
1979	8.59	5.05	5.28	4.40	5.17	4.29
1980	7.95	4.50	4.20	4.02	3.93	3.75
1981	19.10	14.93	14.83	14.68	11.88	11.74
1982	10.71	7.19	7.08	6.51	4.01	3.44
1983	10.25	5.56	5.66	6.65	5.49	6.48

Source: "The Greek Economy" ed. Bank of Greece and monthly statistical bulletins of the BoG. Author's calculations

$$D2 = DP1 - \pi(TR).$$

$$D3 = DP - \pi(TR) - (\pi - \tilde{e})FL - \Delta CL$$

$$D4 = DP1 - \pi(TR) - \Delta(CL).$$

$$D5 = DP - \pi(TR + CL) - (\pi - \tilde{e})FL.$$

$$DBTSC = DBTS - \pi(TR) - (\pi - \tilde{e})FL.$$

where,  $\pi$  is the rate of price increase and  $\tilde{e}$  is the rate of change in exchange rate.

According to table IV-2, the actual deficit ratio was reduced when it was corrected for the inflation depreciation of debt service expenditures, their difference becoming more substantial after the period 1973. Examining D1, D2 which examine the deficit ratios



corrected for the depreciation of total and domestic debt, respectively we can see that the domestic impact of the deficit was more expansionary than the total impact, that is including the balance of payments effects of the budget except the years 1975, 1980, 1981, 1983. D3 and D4 which stands for proxies of the potential crowding out effects of the budget show a systematic crowding out effect since they have a positive sign, except for the years 1967, 1969, 1978. Column 6 which represents the deficit corrected for the total debt including the borrowing from the central bank which is equal to the creation of new money, shows clearly the reduction in the actual deficit especially after the 1973 period. The same holds for the reduction in the debt service ratio when it was corrected for its depreciation due to inflation.

Table IV-3 represents the structural deficit, DSP and its corrections for inflation depreciation of government debt. Moreover, the real interest rate is adjusted for the growth of trend GNP (see Buiter, 1982). DS1 is the structural deficit net of interest payments (DSN) plus the stock of treasury bills and foreign debt, corrected for their depreciation due to inflation. DS2 is DS1 corrected for the treasury bills alone. DS3 is DSN corrected to present the potentially crowding out pressures. DS4 stands for DS3 corrected only for the inflation depreciation of domestic debt.

The reason that we have include in this analysis expressions like D2, D4, DS2, DS4 which account for the potentially inflationary and crowding out effects,

respectively, is to isolate the budget impact on the foreign sector. However, if the current account or the balance of payments is included as a target in the stabilization policies, measures like as D1 (DS1) and D3 (DS3) are better indicators of the budget impact since are consistent with the overall economic policies.

The variables of table IV-3 were estimated from the following formulas :

The variables are expressed as percentages of trend nominal GNP.

DSN = DSP minus the debt service expenditures.

DBTS1= DBTS paid in drachma.

DS1 =DSN+[DBTS-( $\pi+y_T$ )(TR)-( $\pi-\tilde{e}+y_T$ )FL].

DS2 =DSN+[DBTS1-( $\pi+y_T$ )(TR)].

DS3 =DSN+[DBTS-( $\pi+y_T$ )(TR)-( $\pi-\tilde{e}+y_T$ )FL- $\Delta CL$ ].

DS4 =DSN+[DBTS1-( $\pi+y_T$ )(TR)- $\Delta CL$ ].

The expressions assume that DBTS is approximated by  $n(TR)$ , where  $n$  is the actual interest rate paid. So  $n(TR)-\pi(TR)=rTR$ , where  $r$  is the real interest rate. The same applies to the foreign debt, with  $(\pi-\tilde{e})$  in the place of  $\pi$ .

Examining DSP and DSN we see the reduction in the structural deficit (DSP) when the structural debts service payments have been excluded from the former. Their difference is even larger after 1973. Comparing DSP and DS1 we see the apparent reduction in the structural deficit when its expenditures for the debt service have been corrected for their inflation depreciation. Although during the years before 1973 they move with the same pace after 1973 DS1 becomes

constantly smaller than DSP.

DS2 which is a proxy for the inflationary impact on the domestic economy only, is smaller in all the years than the DS1, except 1983. (DS1 is the same proxy as DS2 but for the economy as a whole including the balance of payments).

This means that the structural budget has a less inflationary impact on the domestic economy than on the economy as a whole. This result is the opposite than the one we obtained when we examine the same indicator but for the actual budget ratio, corrected for inflation depreciation of actual debt, D1, D2.

According to the last two columns which show the crowding out effects of the structural budget, corrected for the whole and the domestic debt respectively, crowding out occurs during the whole period under examination except the years 1963 and 1978.

Finally for comparison reasons we present, in table IV-4, the changes in the actual budget ( $\Delta DP$ ), the structural budget ( $\Delta DS$ ), the structural budget corrected for potentially inflationary pressures ( $\Delta DS1$ ) and crowding out pressures ( $\Delta DS3$ ), respectively.

Given the complexity of the monetary system and the regulations for the holdings of treasury bills, we consider that the potentially crowding out concepts of the deficit should be treated very cautiously. We can interpret quite safely the concept DS1 as the structural deficit corrected for the potential revenues the government extract through the inflationary condition that exist in the economy. Thus  $\Delta DS1$



Table IV-4

Comparisons between the different public deficit measures.

Year	$\Delta DP$	$\Delta DSP$	$\Delta DS1$	$\Delta DS3$
1961	-.99	-2.38	-2.47	-2.37
1962	0.95	1.78	1.58	1.57
1963	-1.59	-1.88	-1.64	-3.20
1964	2.15	2.63	2.73	4.36
1965	-0.62	-0.73	-0.72	-1.41
1966	-0.94	0.02	0.04	-0.37
1967	-1.67	-0.34	-0.39	-0.42
1968	1.53	1.49	1.45	2.36
1969	0	0.10	0.29	-1.98
1970	0.05	-0.13	0.01	3.13
1971	0.71	0.75	0.82	0.22
1972	0.31	0.30	0.20	-0.25
1973	2.30	2.07	1.47	2.13
1974	-0.44	0.69	-0.02	-0.12
1975	0.20	-0.86	-1.81	-2.29
1976	1.81	1.41	1.65	2.09
1977	-0.66	-0.49	-0.65	-1.09
1978	-0.95	-0.55	-1.11	-6.26
1979	1.12	1.49	0.63	5.93
1980	-0.05	-0.64	-1.07	-1.24
1981	10.01	11.15	10.63	7.96
1982	-3.73	-8.39	-7.75	-7.87
1983	-2.02	-0.46	-1.42	1.47

Source: "The Greek Economy" ed. Bank of Greece and monthly statistical bulletins of the BoG. Author's calculations approximates the change in the deficit corrected for the

effect of the economic conditions on the deficit and the extra revenues the government gains from the depreciation of treasury bills and foreign debt. To interpret  $\Delta DS3$  as the change in the potentially crowding out conditions we should know in a precise way the existing mechanism for the supply of loans and the investment behaviour of the investors. According to the above we argue that  $\Delta DS1$  can be a better indicator of the  $\Delta DP$ . Comparing the two indicators in table IV-4 we can see that in the year 1966, 1969, and 1975 the change in the conventionally measured budget was a false indicator of the budgetary impact on the economy. The budget, according to its structural concept was

expansionary in the years 1966, 1969, and restrictive in 1975, contrary to the restrictive, neutral and and expansionary, respectively, indication of the change in the conventional budget.

Note that the budget deficit is defined as the sum of the central government's deficit plus the deficit of the accounts of consumer goods and the organizations of trading agricultural products on behalf of the government.

For the calculation of the structural deficit, the deficit of the latter accounts is added to the structural deficit of the government.

C) The Budget Margin.

The objective of budgetary policy in the Netherlands was to maintain a structural budget deficit equal in size to the deficit that existed in a base year. At this base year demand for private savings from the public and private sectors equalled the supply at a normal level of economic activity. The margin is a constraint to the government expenditure. Any increase (decrease) in revenue above (below) the margin is supposed to be caused by cyclical fluctuations in the level of economic activity. The budget margin is the product of the trend rate of growth of real output and the income elasticity of the revenue system.

The budget margin is defined in real terms (at least this was the case when was originally introduced) at the price level during the base period and then it is adjusted to take into account the actual price increases for presenting it in current price levels. Any revenue resulting from an increase in the ratio of taxation to income that occurs because of inflation should be offset by reductions in tax rates and should not be used to finance increases in government expenditures. This reduction is not included in the margin. The increase in tax revenues that is treated as being available to finance the cost of providing government goods and services is proportional to the increase in money income



resulting from inflation. This increase in tax revenue is called the proportional increase in actual tax revenues. Having realized the fact that the proportional increase in tax revenues was equal to the general increase in wages and salaries, the latter were not included in the expenditures that were tested against the margin. Increases in the cost of the purchases of goods and services are included in expenditures which are tested against the budget margin defined in real terms. This means that the size of the margin expressed in real terms will vary with the rate of inflation in the prices of goods and services, purchased by the government. This system of earmarking is a conceptual one. The size of general increase in wages and salaries in the government sector in any period is determined by the movement of wages and salaries in the private sector of the economy and not by the proportional growth in tax revenue, resulting from inflation. The budget margin analysis takes the original estimates of the preceeding year as the starting point. This is because it requires that departures from the available margin in previous periods be rectified in the following periods. Only descretionary changes in tax (except those reductions in tax rates to offset the increases in the tax burden resulting from inflation) are permitted to finance increases in expenditure.

6.1.4 The rules that govern the stabilization role of the

structural budget can be described by the following :

- 1) The (trend) rate growth of the economy determines the additional revenues which either, can finance the increase in expenditure or, to reduce the burden of taxation in any given budgetary period.
- 2) Any increase in expenditure above the amount that is permitted by the structural increase in tax revenue is financed either, by discretionary tax increase, or increased nontax revenues. This is because the purpose of the budget margin is to maintain an unchanged structural budget deficit over time.
- 3) Several items which are regarded irrelevant (because of their minor effects in demand) are not subject to this rule and are not tested against the budget margin .

The first rule helps the government to increase aggregate demand by a constant rate every year. Actual deficits are determined by the level of government expenditures and other exogenous variables. The increased expenditures, relative to the revenues, when actual growth is less than the desired trend, will neutralize any incipient drag. (In other systems like the F.E.S, the fiscal drag in any business upturn may be destibilizing by slowing down the increase in income- if income is increasing at a less rate than the desired one).

Although the margin treats fiscal drag in a satisfactory way, it has some drawbacks :

- 1) Considering the fact that expenditures are permitted to increase at a faster rate than the trend growth path, an expanding relative size of the government is assumed.
- 2) The steady growth of expenditures implies that the fluctuations in the use of resources by the private sector of the economy are greater than those affecting the government sector. To this argument it must be added the fact that cyclical is quite different from anticyclical policy. So the drawback mentioned above is active when the alternative could have been a pure anti-cyclical policy. A cyclical policy is by its nature likely to have a stabilizing influence.
- c) The margin does not allow for decreases in expenditures. This is because discretionary increases or decreases in expenditures are not allowed.

The margin in any period is given by

$$M_1 = y_{\tau} \cdot n \cdot T_0 + \Delta NTR$$

where  $n$  is the elasticity of the tax system,  $y_{\tau}$  is the rate of growth of trend GNP,  $\Delta NTR$  the growth in nontax revenues between period 0 and 1. Similarly, for the second period we can have :

$$M_2 = y_{\tau} \cdot n \cdot (1 + y_{\tau} \cdot n) \cdot T_0 \text{ or } M_2 = (1 + y_{\tau} \cdot n) \cdot M_1$$

Although the SBM was to be measured in real terms, it is important to take into account the tax revenues resulting from the purely nominal increase in trend national income, as a consequence of inflation. Thus the growth of tax revenues can be divided into three



components :

- 1)  $n y_{\tau} T_0$  : real budget margin
- 2)  $p (1 + y_{\tau}) T_0$  : proportional budget margin
- 3)  $(n - 1) p (1 + y_{\tau}) T_0$  : the extra nominal margin due to the elasticity of the tax system which is greater than unity.

where  $p$  stands for the rate of increase in prices.

Formula (1) is used for calculating the real margin and determines the increase in expenditures.

Formula (2) is earmarked for meeting general increases in salaries in the public sector.

Formula (3) combines the influence of inflation and the progressivity of the tax system and can be used to decrease income tax rates. In inflationary periods using compartment (1) to maintain public spending in real terms becomes very difficult. It can be argued that any increase in wages is not necessarily inflationary and should be covered by taxation. This can be reinforced by the fact that the proportional increase in tax revenues exceeded the increase in wage bill, and thus led to a reduction in the structural budget deficit and an unintended drag. Thus, a unified margin in nominal terms can be used (the sum of the three above mentioned components). In fact in inflationary periods

the following has been used :

$$M1 = n (y_{\tau} + p + py_{\tau}) T_0 + \Delta NTR + (y_{\tau} + p + py_{\tau}) D_0 \quad (4)$$

where  $D_0$  is the budget deficit in year zero.

This formula was introduced because the structural budget deficit was considered as being too small. Thus instead of having a constant deficit in money terms, a constant deficit in relative terms, that is a constant percentage of national income, was preferred.

The Dutch approach reflects a move from short-run planning to medium term planning and stresses the growth context of budgetary balance. This is done by allowing any increase above the acceptable budget deficit to be financed by increases in taxes and nontax revenues. This policy can maintain a deficit consistent with the full employment level of total demand at the structural growth rate. Discretion is only allowed to operate on a cyclical margin. This reflects an attempt to reconcile secular (growth) with the cyclical (short-run) aspects of budgetary planning. Secular and short-term aspects of budgetary planning are embodied to the same measure. The automatic or secular adjustments are to adjust the budget to changes in the economy, while the discretionary (short-term) cyclical ones adjust the economy to the budget plan. This implies that the structural growth rate is independent of budgetary policy while deviations from long-run structural growth can be partially corrected.

Some drawbacks can be seen in this aspects :

- a) It can be argued that changes in government expenditures or taxes affect the initial structural equilibrium.
- b) Different types of taxes or expenditures exert certain influences on the private sector surplus and the future economic development.
- c) The structural growth rate and the progressiveness of the tax system can be mutually determined.

To compensate for these drawbacks frequent revisions can related to the magnitudes of the different parameters used to calculate the margin (base year, tax elasticity).

Three principles are embodied in this approach :

- a) structural constancy, b) marginal balancing, c) automatic cyclical stabilization.

The first principle implies a base year in which total aggregate supply balance at full (high) employment. The deficit of the public sector is the balancing power in the economy injecting that level of aggregate demand required to keep the economy expanding along its medium term growth path. Since changes in the structural parameters are realized in the longer-run we have to separate those changes arising from structural changes from those caused by short-run cyclical factors.

Since the SBM is assumed to have only marginal effects on private sector functions, constancy in



equilibrium conditions for growth can be assumed. Given the fact that the structural trend in the economy is satisfactory, public sector transactions can be viewed as a balancing item. Changes in the structural development were introduced by revising the acceptable budget deficit upwards. Furthermore, since private investment levels were not enough in 1977, a temporary increase in the deficit was introduced to stimulate private investment. However periods of prolonged disequilibrium create problems for the SBM policy by hindering the structural development of the economy.

The marginal balancing principle follows from the rule that any expenditure above such a margin should be financed by tax revenues. This is to maintain a constant stimulus, so as to ensure that the economy remains on the hypothetical "structural growth path".

(By operating this the balanced budget multiplier is assigned a value of zero). The third principle derives from the basic assumption of a normal balanced full employment growth path and the aim of marginal balancing. This reliance on automatic stabilization may help to maintain high employment levels and prevent autonomous disturbances from precipitating a major recession, but discrete policy is needed to accelerate recovery from unemployment and give stimulus to the achievement of higher growth rates. The usefulness of discretionary policy for the former made them to exclude

such expenditures for the SBM rule. The SBM rule is followed by annual reviews of the short-run implications of SBM (impulse analysis).

The interaction of the economic and constitutional aspects of the budget made it difficult to use it in practice. The aim of the SBM was to hold down the increase in public spending and not to increase expenditure and the necessary tax revenue to finance the expenditure. The progressive increase in tax revenue was not compensated by reductions in tax rates. This confirms the acceptance of an increase in public spending greater than the structural growth rate in national income. The compromise of the long-term and short-term needs of the budget is jeopardised in inflationary situation and can side-step the essential problems of short-run economic policy. This emerges from the differences in the type of fiscal regime required for secular as opposed to cyclical purposes. The built in stability can generate fiscal drag which can be avoided by considerable political and administrative difficulties and sacrificing some of the built in stability of the system.

#### D) The Budget impulse

The budget impulse (BI) measures the impact of the budget on the economy and it is distinguished from the SBM by its use as an indicator of fiscal impact in a

cyclical context, while the latter guides the long-run growth of government expenditure. It measures only whether the budget is on the right side of neutrality not the adequacy of neutrality. It is a dynamic concept since it examines the changes from year to year. A non-neutral growth rate of expenditure can be compensated by an increase/decrease of tax rates, where neutrality of expenditure can be disturbed by changes in taxation. In the calculation of the BI therefore, the amount of tax increase/decrease is deducted/added to that of the increase of expenditure. The extra amount accruing from net progressiveness of the tax system is also deducted and the same is done with the growth of non-tax revenue. So we have :

$$BI = [(E_t - E_{t-1}) - (R_t - R_{t-1} - yR_{t-1})] / E_{t-1}$$

where E, R, are expenditures and revenues respectively, and y stands for the rate of growth of actual GNP.

The net stimulus to the economy is given by the percentage ratio of impulse to the previous year's relevant expenditures. This stimulus is compared with the trend rate of growth of GNP and the actual growth in GNP, expressed in both nominal and real terms. In inflationary periods the net impulse is to be compared with the increases in GNP (in both real and nominal terms). If it is compared with the trend rate of growth of GNP in periods of inflation, it would indicate a more expansionary budgetary policy. A given budgetary policy



can be considered neutral when the stimulus equals the structural rate of growth of national income. When we compare the BI with the structural rate of growth of national income we simply admit that the purpose of budgetary policy is consistent with the budget margin philosophy.

If BI is compared with the income growth in real terms, certain assumptions must be made as far as the increase in wages is concerned. Using the nominal rate of national income this difficulty is avoided. Cyclical neutrality does not mean that the government sector could not absorb a larger part of GNP. This can be achieved by higher tax rates or by a progressive tax system which is not compensated by a decrease in tax rates.

The drawbacks of this measure can be summarized in the following :

As only the changes from one year to another are measured no preference is given to any year of equilibrium. Thus, if in year  $t$  a restrictive measure is taken and abolished in year  $t+1$ , the  $t+1$  year budget will have an expansionary impulse. Furthermore, the revenues which are deducted from the change in government expenditure are calculated as  $R_t - (1+y)R_{t-1}$  to indicate only discretionary changes. However an endogenous element, is being introduced, if this extra yield in year  $t+1$  is the consequence of business cycle.

It is seems therefor, preferable to calculate the extra yeild on the basis of medium term growth rate.

Comparing the Dutch measure, BI, with the F.E.S the following remarks should be mentioned. The F.E.S tries to fill the gap between actual and hypothetical full employment budget balance. When the gap is filled, the cyclical neutrality is measured by the change in the full employment balance from one year to another. The balance of one year has nothing to do as a measure of budget impact. Budget neutrality is expressed by the constant ratio of the full employment balance to GNP. If revenue is the only item in the budget to be influenced by the business cycle and if the tax system is proportionate the two measures lead to the same result. Under a progresive tax system a small difference remains. In case of underemployment the neutrality of F.E.S allows for somewhat larger increase in expenditure.

What is important is the treatment of fiscal drag in BI. Even if tax rates are unchanged discretionary policy is defined as the excess of tax revenue over that amount they would yield if income elasticity were equal to unity.

Table IV-5 shows the SBM for Greece. BM1, BM2, BM3, correspond to the compartments (1), (2), (3), respectively. SBM1 is their sum plus the change in the nontax revenue, (excluding changes in the investment

revenue) and SBM1D is the difference between the SBM and the change in the expenditures, excluding the expenditures in investment and debt service. The reason for the latter omission is that, according to the SBM rules, only expenditures that affect the demand directly, are to be tested against the budget margin. Given the fact that, the public does not hold any government bonds, these expenditures do not affect directly the demand of the public. The omission of the former variable enable us to examine the ordinary budget of the central government exclusively.

In table IV-6 the difference between the proportional change in the taxes, (BM2), and the change in the different categories of expenditures are presented.

Where  $B2W = BM2 - WGD$

$B2C = BM2 - CGD$

$B2T = BM2 - GTD$

WGD=The change in wage bill of the central government.

CGD=The change in the other consumption expenditures.

GTD=The change in all current expenditures (except those on the debt service.

The compartment BM2 which was earmarked for meeting general increases in wages and salaries was less than the increase of the latter up to 1972. The same applies



# **TEXT BOUND INTO THE SPINE**

to the other consumption expenditures. The total increase in current expenditures was greater than the proportional increase in taxes except the year 1974 and the period between 1978-1982. Since the emergence of a high budget deficit coincided with the inflationary pressures we used the unified budget margin (SBM1). Moreover, given that the overall budget margin was high enough, as SBM1D shows, there was no need to use the formula (4).

Table IV-5

Estimates of the budget margin for the ordinary budget (in billion drachmas).

Year	BM1	BM2	BM3	SBM1	SBM1D
1961	1.06	0.58	0.09	2.08	0.31
1962	1.15	0.32	0.05	1.62	0.26
1963	1.24	0.63	0.09	2.04	0.31
1964	1.34	1.06	0.14	2.86	-0.64
1965	1.45	0.87	0.11	2.69	-1.15
1966	1.57	1.01	0.12	3.05	-0.05
1967	1.70	2.48	0.23	4.29	-1.54
1968	1.83	1.30	0.14	3.84	0.05
1969	1.98	0.80	0.09	3.20	-0.61
1970	2.15	1.19	0.12	3.78	0.64
1971	2.32	0.98	0.10	3.48	-0.89
1972	2.51	1.28	0.12	4.02	-3.85
1973	2.71	8.64	0.36	13.15	1.85
1974	2.93	83.60	0.95	88.56	65.02
1975	3.17	23.39	0.53	36.07	6.31
1976	3.43	23.58	0.51	23.84	-6.14
1977	3.71	28.89	0.53	41.19	6.95
1978	4.01	34.81	0.55	36.76	3.89
1979	4.34	76.79	0.73	88.79	28.55
1980	4.70	103.61	0.78	116.89	71.61
1981	5.08	277.24	1.08	283.94	77.52
1982	2.90	476.54	1.25	486.79	361.40
1983	3.08	131.02	0.77	146.81	-2.82

Source: "The Greek Economy" ed. Bank of Greece and monthly statistical bulletins of the Bank of Greece. Author's calculations

Table IV-6

Comparisons between the proportionate change in taxes and the changes in the different categories of current expenditures (in billion drachmas).

Year	B2W	B2C	B2T
1961	-0.37	-0.37	-1.18
1962	-0.37	-0.37	-1.03
1963	-0.44	-0.44	-1.10
1964	-0.47	-0.47	-2.43
1965	-0.71	-0.71	-2.96
1966	-0.89	-8.04	-2.09
1967	0.15	-1.81	-3.35
1968	-0.58	-1.25	-2.49
1969	-1.29	1.23	-3.01
1970	-0.91	-2.63	-1.95
1971	-1.85	-2.12	-3.39
1972	-1.06	-2.28	-6.59
1973	3.16	0.22	-2.66
1974	71.82	65.02	60.06
1975	13.76	1.81	-6.36
1976	10.87	4.11	-6.40
1977	12.99	3.83	-5.35
1978	12.30	6.84	1.94
1979	50.01	44.25	16.55
1980	75.89	63.60	58.33
1981	234.52	202.27	70.83
1982	407.01	382.22	351.16
1983	66.10	6.08	-18.61

Source: "The Greek Economy" ed. Bank of Greece and monthly statistical bulletins of the Bank of Greece. Author's calculations.

Table IV-5 shows that after 1973 the structural change in the revenues of the ordinary budget was higher than the change in the actual expenditure as was defined previously. Thus the structural budget was restrictive during the afore period except in the years 1976 and 1983. Moreover, it is interesting to note the actual difference between the change in the structural revenues and actual expenditures, which became extremely large after the year 1974.



In table IV-7 the total structural budget is presented. Thus it includes investment expenditures and revenues and inflation adjusted debt service payments.

$$SBM2 = SBM1 + IRGD$$

IRGD = Change in investment revenues.

$$SBM2D = SBM1 - GTD$$

GTD = Change in total expenditures, except change in debt service payments.

$$SBM3D = SBM2 - GTD1.$$

GTD1 = GTD plus change in debt service expenditures, corrected for the inflation depreciation.

$$SBM4D = SBM2 - GTD2.$$

GTD2 = GTD1 plus the change in the deficit of the agricultural products account.

Since we are interested in the total budget of the government sector we draw our attention on the SBM4D measure. It clearly shows that the change in the structural tax revenues of the budget was greater than the change in the expenditures only in the years 1974 1980 1982. Thus indicating a constant expansionary policy through the whole period under examination except in the years mentioned above.

Table IV-8 represent the budget impulse measure for the Greek economy. Following the Dutch budget philosophy we have excluded the debt service payments and non-tax

Table IV-7

The budget margin for the total budget of the central government (in billion drachmas).

Year	SBM2	SBM2D	SBM3D	SBM4D
1961	2.24	-0.46	-1.05	-1.62
1962	1.56	-0.59	-1.25	-2.46
1963	1.95	1.02	-0.28	-0.28
1964	3.06	-0.75	-1.87	-5.34
1965	3.26	-0.56	-2.00	-5.02
1966	2.60	-2.22	-3.83	-5.91
1967	5.01	-0.95	-3.28	-1.09
1968	3.09	-2.74	-5.90	-6.04
1969	3.16	-2.23	-6.03	-6.07
1970	3.87	-1.37	-6.00	-5.90
1971	3.24	-3.19	-8.88	-10.40
1972	5.23	-8.05	-13.18	-13.90
1973	11.88	-3.35	-1.12	-15.23
1974	89.01	66.51	73.34	62.86
1975	36.12	-2.87	-12.21	-20.87
1976	23.55	-14.08	-11.15	-38.92
1977	41.40	2.36	5.49	-19.50
1978	36.70	-2.85	-1.87	-22.55
1979	89.96	24.77	30.99	-8.39
1980	115.66	71.47	60.05	11.00
1981	290.10	68.95	47.38	-65.76
1982	485.62	339.41	340.47	239.30
1983	148.68	-50.90	-148.67	-155.37

Source: "The Greek Economy" ed. Bank of Greece and monthly statistical bulletins of the BoG. Author's calculations  
 revenues from the expenditure and revenue sides of the

impulse measure. BI stands for the impulse, of the total budget that is the ordinary and investment one of the central government, DCEB1, DCEB2, stand for the deviations of BI from the growth rate of trend and actual nominal output, respectively. The variable D2 shows the change in the total budget excluding expenditure for debt service and non-tax revenues. Comparing DCEB2 and D2 we can clearly see that their signs coincide over the period under examination the only difference being in the cases when the DCEB2

Table IV-8  
Estimates of BI for Greece.

Year	BI	DCEB1	DCEB2	D2
1961	0.12	0.03	0	-.15
1962	0.07	-0.05	.01	.19
1963	0.06	-0.03	-0.06	-.96
1964	0.12	0	0	0
1965	0.11	0	-0.02	-.34
1966	0.08	-0.04	-0.03	-.42
1967	0.09	-0.01	0	.08
1968	0.11	0.02	0.02	.37
1969	0.12	0	-0.02	-.30
1970	0.11	0	-0.01	0.19
1971	0.11	0	0	0
1972	0.17	0.04	0.03	.46
1973	0.26	-0.02	-0.02	-.31
1974	0.21	-0.10	0.04	.60
1975	0.29	0.08	0.10	1.71
1976	0.17	-0.07	-0.06	-1.71
1977	0.20	0	0.03	.62
1978	0.16	-0.06	-0.04	-.87
1979	0.22	-0.05	0	-.17
1980	0.19	-0.07	0	-.12
1981	0.56	0.28	0.37	6.74
1982	0.13	0.25	-0.10	-2.38
1983	0.23	-0.03	0.04	1.08

Source: "The Greek Economy" ed. Bank of Greece and monthly statistical bulletins of the BoG. Author's calculations. indicates a neutral budget, thus taking the value of

zero. Consequently, we can argue that the change in the conventionally measured budget deficit (surplus) is a misleading indicator as far as the neutrality of the budget is concerned. The measure DCEB2 was preferred to CEB1 since we are dealing with inflationary variables.

Note that the BI and SBM were calculated using the trend GNP as estimated in section (B) of this chapter.



E) The cyclical neutral budget (CNB)

The main features of the CNB can be summarised in the following :

- a) It is a summary indicator of an hypothetical cyclically neutral budget against which the countercyclical impact of the budget can be assessed.
- b) It postulates a budgetary planning consistent with the steady growth of potential GNP.

The CNB can be constructed by : 1) selecting a base year of full employment, 2) estimating the cyclically neutral government expenditure and tax revenue. The former is calculated as a fixed proportion of potential output, the factor of proportionality being the base year ratio of government expenditure to potential output. Cyclically neutral taxes are assumed to constitute a fixed proportion of actual GNP, the factor of proportionality being the base year ratio of taxes to actual GNP. This definition of cyclical neutrality excludes fiscal drag from being a source of imbalance since revenue growth cannot outstrip expenditure growth. At the same time any secular excesses or deficiencies of private demand will tend to be offset by the budget. The reasoning behind the definition of neutral revenues and expenditures can be seen if we consider the following. The relative shares of private and public sector to national income remain constant, irrespective of whether potential output equals actual output. If neutral revenues were defined as a fixed proportion of potential GNP, whenever actual GNP falls short of potential a

relative larger share of national output would accrue to the public sector. On the other hand, if government follows the neutral expenditure rule, when actual output is less than the potential, the output received by the private sector would be higher than the one which would be received, if government would not follow this rule. To compensate for this rigidity in the planning of expenditure, another rule was introduced. A change in the State quota is cyclically neutral when the cyclical effects that arise from the expenditure side are matched by equivalent effects in the opposite direction, arising from the revenue side. This treatment of expenditure and taxes (as having an equivalent impact on aggregate demand) can only be justified in a highly elastic taxation system).

Cyclical tax neutrality is defined as that level of revenue generated when the buoyancy of taxes with respect to GNP is maintained at unity. Buoyancy represents the proportional change in revenue that results from all sources automatic or discretionary.

Given the fact that labour supply is highly elastic in W. Germany, potential output is calculated by assuming that potential output is proportional to the stock of capital. The formula used is

$$Y_{pt} = k_{t-1} (K_t + K_{t-1})/2 \quad (1)$$

where,  $Y_{pt}$  is the potential output,  $(K_t + K_{t-1})/2$  is the average stock of capital during the years  $t-1$ ,  $k_t$  is the full capacity trend ratio of output to capacity. The main notions which characterise the CNB can be described as follows.

The fiscal gap can be defined as that level of government purchases, which would be sufficient to bring aggregate demand at the level of the potential output. According to this we have :

$G = Y_p - [C + I + (X - M)] \dots (2)$ , where  $G$  is the required level of government purchases  $C$ ,  $I$ ,  $(X - M)$  are the consumption, investment, and trade balance, respectively, observed at potential output level. Equation (3) describes the consumption function,  $C = b(Y_p - T) \dots (3)$ , where  $b$  is the marginal propensity to consume,  $T$  is the level of tax yield. Equation (2) can be rewritten as :

$G/Y_p = (1 - b) - (a + f) + b(T/Y_p) \dots (2)'$ , where,  $f = (X - M)/Y_p$ , and  $a = I/Y_p$ . Equation (2)' implies that  $G/Y_p$  can be estimated, if all the information on the right hand side of the equation is known. Realizing the fact that, there will be considerable more than three relevant parameters that we need to measure, the CNB is calculated by proceeding in the following way.

After rearranging (2)', we have :  $(G - bT)/Y_p = (1 - b) - (a + f)$  (4). Given that a past year exists where potential output was attained, we assume that, a) the budgetary posture was appropriate in that year, and b) the great ratios of the economy are constant over the years. We have, then  $(G - bT)/Y_p = (G_0 - bT_0)/Y_{p0}$ , (5) where the  $O$ 's stand for the base year's values of the corresponding variables. The last expression tells us, that the ratio of the weighted budget of the base year to potential output, at that base year, should remain constant over the planning period.

The adequacy of the cyclically neutral budget



depends on the assumption that the great ratios of the economy remain constant. If, for example,  $a$ , keeps rising in the subsequent years then, according to  $(G-bT)/Y_p = (1-b) - (a+f)$ , the budget-potential output ratio implies that, the surplus of the budget must be growing. Adherence to the neutral expenditure and tax rules, means that an inflationary pressure is introduced. Even if the relative constancy of the great ratios is true, a problem remains. If the base year deficit is the result of a very weak investment, and during the next years investment regains its normal level and continue to do so, an inflationary bias is introduced. So what we need is: a) constancy of the great ratios, b) attainment of potential output at the base year and finally c) the great ratios to be close to their long run norms.

The CNB rule accomodates economic growth. This is done by rejecting any budgetary strategy that calls for a zero deficit (or surplus). This is a quite different strategy from the F.E.S. The F.E.S stresses the fact that at full employment a surplus must exist, and the base year budget must be zero. This is because F.E.S is supposed to boost the growth of the economy. (This is done by taxing more heavily than the ammount consistent with full employment balance, and stimulating monetary instruments to avoid deflation). The CNB budget is assuming to create a minimal interference with the growth process, taking the parameters of the economy as given. This is reinforced by the fact that long-term government borrowing is defined as cyclically neutral when it grows at the same rate as the actual national

product. It appears, however, to be a conflict between neutral borrowing and neutral monetary growth. Neutral monetary expansion is defined as the one which is proportional to potential output (avoiding, by this definition, monetary contraction/expansion when actual output falls short or exceeds potential output). Given the neutrality rules for expenditure, taxes, borrowing, monetary expansion, a GNP decrease widens the actual deficit and CNB, which immediately means that either the neutral monetary expansion or neutral borrowing rules must be violated.

The cyclical effects of budgetary policy are defined as those deviations from that budgetary policy which is assumed to be neutral. According to this definition, we have :

$$CEB = (G_a - T_a) - CNB \quad (6)$$

and

$$CNB = g_0 Y_p - t_0 Y_a \quad (7)$$

$Y_p$ ,  $Y_a$  are the potential and actual income levels, respectively.  $g_0$  is the ratio of base year's government expenditure to base year's potential output and to the ratio of base year's tax revenue to the actual output of the base year. If CEB is positive the budget adds to aggregate demand beyond the neutral level, and if it is negative the opposite happens.

To take account of the effects of price increases on the budget, the following formula has been used for the calculation of the CNB :

$$Y_p n_t = Y_{pt} d_{t-1} (1 + r_{nt}) \quad (8)$$

where :

$Y_p n_t$  is the potential output (potential GNP) inflated by cyclically neutral price rise.

$d_{t-1}$  is the preceeding year's deflator.

$r_n_t$  is the neutral rate of price increase.

Table IV-9 presents the CNB and CEB for Greece. For the calculation of CNB the years 1960, 1964, 1969, 1972, 1974, 1980, 1982, were used as the base years. The criteria for changing the base year was the change in the investment ratio in the corresponding years. The trend nominal GNP was used again in the place of potential output. Furthermore, given the difficulties in defining cyclically neutral price increases we have avoided to use equation 8 for the calculation of trend nominal output.

DP1 is the deficit of the total budget of the central government (excluding the deficit in the accounts the government keeps with the Bank of Greece) as a percentage of nominal GNP, and  $\Delta DP1$  stands for its change. CNB is the cyclical neutral budget as a percentage of the trend nominal GNP. CEB is the deviation of the actual budget from the cyclical neutral one, expressed as a percentage of trend nominal GNP.

Table IV-9 shows that the CNB is in deficit throughout the period. Examining the period after 1973 we see that the budget adds to aggregate demand in the years 1975, 1976, and 1981. According to the change in the actual deficit an increased deficit appeared in 1974, 1975, 1977, 1981, and 1983, which is conventionally interpreted as adding to demand. Thus,



**TABLE IV-9**  
Estimates of the CNB and CEB for Greece

Year	DP1	ΔDP1	CNB	CEB
1960	2.50	...	2.45	0
1961	2.36	-0.15	1.92	0.48
1962	2.85	0.19	2.70	0.05
1963	2.19	-0.96	2.31	-0.14
1964	2.20	0	2.21	0
1965	2.09	-0.34	1.91	0.22
1966	1.77	-0.42	2.09	-0.31
1967	2.11	0.08	2.35	-0.25
1968	2.59	0.37	2.42	0.14
1969	2.64	-0.30	2.66	0
1970	2.74	-0.19	2.56	0.22
1971	2.97	0	2.50	0.52
1972	3.55	0.46	3.66	0
1973	3.20	-0.31	3.62	-0.31
1974	3.80	0.60	3.52	0.00
1975	4.54	1.71	3.79	0.36
1976	4.34	-1.17	3.91	0.02
1977	4.43	0.62	4.45	-0.57
1978	4.26	-0.87	4.59	-0.89
1979	4.44	-0.17	5.11	-1.38
1980	4.28	-0.12	3.41	0
1981	11.66	6.74	4.62	3.97
1982	9.43	-2.38	9.71	0
1983	11.09	1.08	11.08	-0.31

Source: "The Greek Economy" ed. Bank of Greece and monthly statistical bulletins of the Bank of Greece. Author's calculations.  
the two measures coincided in 1975 and 1981.

To make the cyclical neutral budget consistent with the depreciation of government debt due to inflation we recalculate the CNB and CEB by correcting them for the latter. Thus, we re-estimate the CEB without including the DBTS and then we add the inflation corrected ones to the former. The CEB was estimated again by subtracting it from the actual deficit and then dividing by the trend GNPN. In Table IV-10 we present the new results where CEB2 and CNB2 include the correction of DBTS due to inflation depreciation. For comparison reasons we also present the DP1 and ΔDP1. We can see that the CEB2 adds to the demand during the whole period except for the years 1962 1963 1966, 1967.

Table IV-10

Estimates of CNB and CEB corrected for the inflation depreciation of government debt

Year	DP1	$\Delta$ DP1	CNB2	CEB2
1960	2.50	...	2.35	0.11
1961	2.36	-0.15	1.85	0.55
1962	2.85	0.19	2.85	-0.10
1963	2.19	-0.96	2.56	-0.39
1964	2.20	0	1.96	0.24
1965	2.09	-0.34	1.82	0.31
1966	1.77	-0.42	2.06	-0.28
1967	2.11	0.08	2.32	-0.22
1968	2.59	0.37	2.53	0.03
1969	2.64	-0.30	2.23	0.44
1970	2.74	-0.19	2.29	0.49
1971	2.97	0	2.28	0.74
1972	3.55	0.46	2.94	0.72
1973	3.20	-0.31	2.43	0.88
1974	3.80	0.60	2.17	1.35
1975	4.54	1.71	1.65	2.50
1976	4.34	-1.17	2.22	1.70
1977	4.43	0.62	2.93	0.95
1978	4.26	-0.87	2.76	0.94
1979	4.44	-0.17	3.16	0.57
1980	4.28	-0.12	0.71	2.70
1981	11.66	6.74	2.07	6.52
1982	9.43	-2.38	5.55	4.16
1983	11.09	1.08	7.20	3.57

Source: "The Greek Economy" ed. Bank of Greece and monthly statistical bulletins of the B.o.G. Author's calculations.

Finally, we present DS1, DS3, CNBI, and CNBII in

Table IV-11 in order to compare the two different concepts of the structural budget. CNBI is the CNB2 including the deficit the government keeps with the central bank for the financing of the agricultural product account. CNBII is the CNBI minus the borrowing of the government from the central bank. The CNBII and DS3 indicate a crowding out effect during the period under examination, except for the year 1978 for the CNBII and the years 1963 and 1978 for the DS3.

However, given the different philosophy of the two measures any comparisons between them would be a fatal



mistake. The CNB has been calculated using different base periods and it is dependent on the great ratios of the economy. The two measures can be used only independently, depending on the targets of the authorities. If the great ratios (the ratio of investment and/or the current account of the balance of payments to potential/trend GNP) are the main concern of them, the CNB is a better indicator and can be used as a target for the fiscal and monetary policy. However if the whole economy is considered without any particular references to macroeconomic variables the DS can be used as an indicator of the budgetary impact. As far as the Duchth measure is concerned, we consider that its calculation is very complicated since for the margin we want variables that affect demand directly, which are very difficult to identify. A macro model is needed for this. Furthermore it imposes certain restriction on the finance of inflation dependent expenditures and thus it becomes very complicated when inflationary pressures are present. However, it can be a useful indicator of the increases in future expenditures, only in cases that governments are willing and able to control the expenditures of the budget.

Note that the reason that we added the deficit of the accounts that the central government keeps with the Bank of Greece to the structural deficits is that the borrowing from this source comprises the financing of the deficit of these accounts.

F) Quarterly estimates of the structural budget.  
Table IV-12 shows the quarterly estimates of the budget



Table IV-11Comparisons between the different measures of structural deficits

Year	DS1	DS3	CNBI	CNBII
1960	3.20	3.12	3.65	3.74
1961	0.74	0.75	2.33	2.52
1962	2.32	2.32	3.76	3.96
1963	0.67	-0.88	2.57	1.22
1964	3.40	3.48	4.11	4.45
1965	2.68	2.07	3.50	3.17
1966	2.72	1.71	3.09	2.36
1967	2.33	1.29	1.34	0.61
1968	3.78	3.65	2.59	2.83
1969	4.07	1.66	2.24	0.25
1970	4.09	4.79	2.26	3.43
1971	4.91	5.01	2.74	3.35
1972	5.11	4.76	3.13	3.38
1973	6.58	6.90	5.36	6.25
1974	6.56	6.78	3.84	4.67
1975	4.74	4.49	2.79	3.19
1976	6.40	6.58	5.19	6.15
1977	5.75	5.50	5.13	5.74
1978	4.64	-0.76	4.27	-0.23
1979	5.28	5.17	5.41	6.15
1980	4.20	3.93	2.92	3.46
1981	14.83	11.88	6.04	3.84
1982	7.08	4.01	9.58	7.29
1983	5.66	5.49	7.42	7.92

Source: "The Greek Economy" ed. Bank of Greece and monthly bulletins of the Bank of Greece. Author's calculations.

of the central government, where

DQ=Actual deficit.

DQS=Structural deficit.

$\Delta DQ$ =Change of DQ.

$\Delta QS$ =Change of DQS.

The actual deficit and the structural one are expressed as percentages of the actual and trend nominal GNP, respectively.

The calculation followed the same process as the annual estimates of the structural deficit of table IV-1, the only difference being the use of aggregate expenditures and revenues, since only these data were available. The data were, also seasonally adjusted. The structural

Table IV-12Quarterly estimates of the structural budget for Greece.

Year	DQ	DQS	ΔDQS	ΔDQ
1975:2	1.21	-0.63	3.79	1.76
1975:3	4.54	8.20	8.82	3.33
1975:4	3.57	5.73	-2.47	-0.97
1976:1	3.09	-3.98	-9.71	-0.48
1976:2	1.42	1.17	5.15	-1.67
1976:3	1.03	7.32	6.15	-0.39
1976:4	4.50	8.17	0.84	3.47
1977:1	2.23	-4.79	-12.96	-2.26
1977:2	3.16	1.21	6.00	0.92
1977:3	2.15	8.30	7.09	-1.01
1977:4	2.83	9.68	1.38	0.69
1978:1	0.36	-3.43	-13.11	-2.47
1978:2	3.66	3.51	6.94	3.30
1978:3	2.79	11.94	8.43	-0.87
1978:4	2.71	12.02	0.08	-0.08
1979:1	4.26	-4.13	-16.15	1.56
1979:2	3.09	3.01	7.14	-1.17
1979:3	1.40	5.41	2.39	-1.69
1979:4	2.72	10.84	5.43	1.32
1980:1	5.54	-1.87	-12.71	2.82
1980:2	2.97	4.85	6.72	-2.57
1980:3	3.03	10.10	5.24	0.06
1980:4	0.09	10.26	0.17	-2.94
1981:1	12.94	-2.67	-12.94	12.86
1981:2	4.72	2.54	5.21	-8.22
1981:3	5.42	8.36	5.82	0.70
1981:4	7.71	8.04	-0.32	2.29
1982:1	7.98	-3.10	-11.13	0.27
1982:2	5.05	3.47	6.56	-2.93
1982:3	6.20	6.51	3.05	1.15
1982:4	3.75	6.71	0.20	-2.45
1983:1	4.22	-7.22	-13.94	0.47
1983:2	10.13	5.22	12.44	5.91
1983:3	6.89	8.15	2.93	-3.24
1983:4	6.47	4.62	-3.52	-0.42

Source: International Financial Statistics of the I M F and  
Quarterly N.A of Greece. Author's calculations: see App(4) and Data.  
 expenditures were not assumed equal to the actual ones,

as was the case for the calculation of quarterly FES.  
 The reason for this is that under inflationary condition  
 quarterly expenditures become very susceptible to  
 economic fluctuations and become very difficult to be  
 controlled by the authorities. This is a common  
 phenomenon in small newly industrialized countries  
 (Khan, 1980, 81).

Comparing DQ and DQS we clearly see that DQS has a negative sign in the second quarter of 1975 and the first quarter of each year, thus indicating a surplus in the budget. The actual budget is in deficit throughout the quarters. It is interesting to note that whenever the structural deficit reaches its peak ratios 10%, 12%, the actual ratios of the budget are much smaller ranging between .03% and 3%. The opposite happens whenever the actual ratio reaches its peak percentages. Furthermore, the DQ can be a misleading indicator of the budget impulse as can be seen from the last two columns, since the DQS has the opposite sign in 19 out of 35 quarters in examination.

#### G) Conclusions

In this chapter we estimated three different summary measures of fiscal stance for Greece. They can be used to examine the contribution of the budget deficit to the inflationary and crowding out pressures of the economy. Since different theoretical assumptions underline these measures, they can be used only independently from each other, depending on the targets of the authorities. The structural deficit uses only a base year and it does not impose any restrictions on the inclusion of certain categories of expenditures and/or taxes that should be used for its calculation. The Dutch budget impulse measure imposes certain restrictions as far as the finance of inflationary expenditures is concerned. Furthermore, it needs for its calculation expenditures that affect the demand directly. The first issue makes the calculation of the budget margin very



difficult under inflationary conditions since the definition of inflationary expenditures becomes complicated. The second issue is relevant to the existence of large a scale macro-model.

The German measure depends on the constancy of the great ratios of the economy and because of this the change of the base year is necessary when changes in these ratios take place. This implies frequent revisions in the measure which in turn makes intertemporal comparisons of different fiscal budgets very difficult.

These considerations concerning the different assumptions which form the base of the different summary measures explain the different results obtained from the calculation of the measures for Greece. Thus, we will avoid any comparisons of the estimated measures.

Given the nonexistence of a priori restrictions imposed on the estimation of the structural deficit, we argue that it is superior to the other two measures.

According to the change of the structural deficit corrected for the inflation depreciation of the government debt, the inflationary pressures of the budget were reduced after 1974 except for the year 1976 1979 and 1981, because the budget became restrictive. What is more important is that the conventionally measured budget was a false indicator of fiscal stance only for the years 1966, 1969 and 1975. This implies that the Greek fiscal deficits are the result of the structural characteristics of the economy and not the result of the cyclical factors. A crowding out effect for the whole period under examination except for the

#### IV-62

years 1963 and 1978 was indicated from the summary measure of fiscal stance. Given the fact that this crowding out pressure was reduced after 1974 and at the same time the inflationary pressures were reduced the budget became restrictive after the emergence of inflationary pressures.

## Appendix 4

A) The fiscal drag

The calculation of fiscal drag is described in what follows.

Equation  $t=f(y)...$ (2), represents the tax liability (t) on the gross income (y) of the nth income earner. Aggregate taxation is given by equation (3) below

$$T = \int_0^N f(y)dn = \int_0^N f[g(n)]dn \quad (3)$$

given that  $y=g(n)$ . Therefore, aggregate income is given by

$$Y = \int_0^N g(n)dn \quad (4)$$

where N stands for the total income earning population.

If all money incomes rise at a given rate (1) and are affected alike, eq. (2) can be rewritten as  $t=f(ly)$  and if the distribution of incomes remains unchanged it becomes  $t=f[lg(n)]$ . Aggregate taxation now becomes

$$T = \int_0^N f[lg(y)]dn \quad (5)$$

and aggregate income is given by

$$Y = \int_0^N lg(n)dn = lY_0 \quad (6)$$

where  $Y_0$  is the base year income. If the tax income takes the exponential form  $t=By^b$  (7) we have

$$T = \int_0^N B l^b [g(n)]^b dn \quad (8)$$



which is equivalent to  $T_t = 1^{bt} T_0$  where  $t$  is time and  $b$  is the income elasticity with respect to taxes.  $T_t$  measures the tax revenues, with unchanged tax rates, which are the result of the increase in income. The increase in income is due to both the increase in productivity and in prices. If  $s$  stands for the rate of productivity increase and  $p$  represents the rate of price increase we have :

$$T_t^a = [(1+p)(1+s)]^{bt} T_0 \quad (9)$$

where,  $T_t^a$  is simply the aggregate money tax which comes from the increase in money income, in other words represents the autonomous level of taxes.

The change in taxes due to the fiscal drag from each year to another is given by :

$$\Delta T = T_t^a - T_{t-1} (1 + (\Delta Y_t / Y_{t-1})) \quad (10)$$

The term  $T_{t-1} (\Delta Y_t / Y_{t-1})$  measures the increase in money taxation which would have taken place if tax revenues from year  $t-1$  had increase by an amount proportional to the increase in money income.

Since for the calculation of expenditures and taxes we use expressions similar to the expression (7), equation (11) can be used to calculate the change of expenditures and taxes over their change that is proportional to the change in trend GNP. It is important to note here that, the above calculation of fiscal drag was introduced for

the direct taxes. However, making the same strong assumptions (unchanged tax rates and distribution of income) we can use the same specification (loglinear expressions) for the different indirect taxes.

# B) The estimated regressions

The results from the regressions , which were used to calculate the structural deficit are :

$$\text{LWG} = -4.1161 + 1.1232 \text{ LGNPN} \quad (1)$$

$$(14) \quad (51) \quad \bar{R}^2 = 99\% \quad \text{DW} = 1.7$$

$$\text{LOCG} = -5.9037 + 1.1991 \text{ LGNPN} \quad (2)$$

$$(5) \quad (15) \quad \bar{R}^2 = 96\% \quad \text{DW} = 1.54$$

$$\text{LOG} = -4.8321 + 1.1483 \text{ LGNPN} \quad (3)$$

$$(4) \quad (13) \quad \bar{R}^2 = 99\% \quad \text{DW} = 2$$

$$\text{LDBTS} = -10.027 + 1.4596 \text{ LGNPN} \quad (4)$$

$$(9) \quad (17) \quad \bar{R}^2 = 93\% \quad \text{DW} = 1.32$$

$$\text{LIG} = -3.4264 + 1.017 \text{ LGNPN} \quad (5)$$

$$(5) \quad (19) \quad \bar{R}^2 = 97\% \quad \text{DW} = 1.64$$

$$\text{LIRG} = 0.23 + 0.052 \text{ LGNPN} \quad (6)$$

$$(.02) \quad (4) \quad \bar{R}^2 = 38\% \quad \text{DW} = 2$$

$$\text{LIT} = -7.8922 + 1.3062 \text{ LGNPN} \quad (7)$$

$$(22) \quad (49) \quad \bar{R}^2 = 99\% \quad \text{DW} = 1.9$$

$$\text{LCORPT} = -10.367 + 1.3827 \text{ LGNPN} \quad (8)$$

$$(13) \quad (22) \quad \bar{R}^2 = 95\% \quad \text{DW} = 1.9$$

$$\text{LIIT} = -4.3995 + 1.0718 \text{ LGNPN} \quad (9)$$

$$(15) \quad (50) \quad \bar{R}^2 = 99\% \quad \text{DW} = 1.7$$

$$\text{LPROPT} = -7.9224 + 1.28 \text{ LGNPN} \quad (10)$$

$$(18) \quad (38) \quad \bar{R}^2 = 98\% \quad \text{DW} = 2$$

$$\text{LDOMIT} = -3.2229 + 1.0224 \text{ LGNPN} \quad (11)$$

$$(7) \quad (33) \quad \bar{R}^2 = 99\% \quad \text{DW} = 1.6$$

$$\text{LTRAIT} = -7.5626 + 1.3092 \text{ LGNPN} \quad (12)$$

$$(10) \quad (23) \quad \bar{R}^2 = 98\% \quad \text{DW} = 1.2$$

$$\text{LOIT} = -3.5672 + 0.0901 \text{ LGNPN} \quad (13)$$



$$(2) \quad (6) \quad \bar{R}^2 = 66\% \quad DW=2$$

$$LOR = -3.5321 + 0.09583 \text{ LGNPN} \quad (14)$$

$$(6) \quad (24) \quad \bar{R}^2 = 96\% \quad DW=2.1$$

$$LTR = -3.8116 + 1.537 \text{ LGNPN} \quad (15)$$

$$(12) \quad (47) \quad \bar{R}^2 = 99\% \quad DW=1.4$$

where :

WG : government expenditures for wages and salaries

OCG : government consumption expenditures other than  
the above.

DBTS : expenditures on government debt service.

OG : other government expenditures.

IG : government expenditures on investment.

IT : income tax revenues.

CORPT : revenues from taxes on corporations.

PROPT : revenues from property taxation.

IIT : revenues from duties and taxes on imports.

DOMI : revenues from taxes on the consumption of  
domestically produced goods.

TRAIT : revenues from taxes on transactions.

OIT : revenues from other indirect taxes.

OR : other revenues.

IR : revenues from government investments.

TR : total revenues except the nontax revenues

(OR+IR).

The elasticity from the last regression was used to  
calculate the BM.

### c) The causality tests.

The use of OLS regressions assumes that our  
variables have a recursive relationship. If this  
assumption is not satisfied, then the OLS results are

void of any significance and misleading. Recursiveness assumes, among other things, lack of feedback between the variables, an issue which theoretically is not very clear that it holds for our variables. This leads us to believe that we must identify the causal relationships between our variables in some other way than simply theoretically. Therefore we intend to use an empirical causality test in the spirit of the suggestions by Granger (1969).

We shall not go into great detail in explaining the theoretical and empirical problems associated with causality tests, but suffice to say that the Granger concept of causality is based on the chronological order of occurrence of events and that the specific test we shall use is that devised by Pierce and Haugh (1977)<sup>1</sup>.

This test consists of cross-correlating pairs of filtered time-series. Then, according to the significance and lag of each cross-correlation, we extract the causal pattern between variables based on a table suggested by Pierce and Haugh.

The causality tests that we conducted yielded the following results:

1) Transformation (filtering) of the variables.

We used the logs of the original variables in order to reduce their variance, and to them we fitted ARIMA models as follows.

$$\begin{array}{ccc} (1-B)(1-.434B-.529B^3) & \text{GNPN} & -.038 = V_t \\ (2.07)(2.57) & & (5.02) \end{array}$$

---

<sup>1</sup> For an application of this test see Karavitis (1986).

$$(1-B)(1-.713B) \text{ WG } -.048 = U_t \\ (4.54) \quad (4.81)$$

$$(1-B) \text{ OG } -.165 = U_t \\ (3.15)$$

$$(1-B) \text{ OCG } -.122 = U_t \\ (4.55)$$

$$(1-B) \text{ DBTS } -.235 = U_t \\ (14.2)$$

$$(1-B)(1-.552B^3) \text{ IT } -.081 = U_t \\ (2.92) \quad (3.44)$$

$$(1-B)(1+.867B+.819B^4) \text{ CORPT } -.378 = U_t \\ (-5.25)(3.19) \quad (41.49)$$

$$(1-B)(1+.637B) \text{ PROPT } -.307 = U_t \\ (-3.78) \quad (8.94)$$

$$(1-B) \text{ IIT } -.160 = U_t \\ (7.06)$$

$$(1-B) \text{ DOMIT } -.156 = U_t \\ (8.63)$$

$$(1-B) \text{ TRAIT } -.192 = U_t \\ (11.93)$$

$$(1-B) \text{ OIT } -.177 = U_t \\ (4.24)$$

$$(1-B)(1+.508B) \text{ OR } -.202 = U_t \\ (-2.67) \quad (5.25)$$

$$(1-B)(1+.593B) \text{ IRG } = U_t \\ (-3.44)$$

$$(1-B) \text{ IG } -.153 = U_t \\ (5.50)$$

$$(1-B) \text{ TR } -.172 = U_t \\ (13.64)$$

$$(1-B) \text{ GTT } -.173 = U_t \\ (9.88)$$

$$(1-B)(1-.417B) \text{ TTR } -.100 = U_t \\ (2.08) \quad (8.55)$$

(t-statistics appear in parentheses - the correlation between the parameters of every model, when they were more than one, was never higher than 11%. This means that the models are not over-parameterized. Finally, we



examined the Box-Pierce Q-statistics which were invariably very low, thus showing that the error term is indeed white noise).

From cross-correlating  $V_t$  with the  $U_t$ 's we found out unidirectional causality running from the V to U's, except for that between IIT and GNPN which was instantaneous (i.e. the causal pattern appeared within the current time-period) and which we arbitrarily assume to have the same actual direction as the others. Also, we found out that OIT and IRG are not causally related to GNPN. This means that our OLS results stand, at least from the causal point of view, with the exception of those between the causally unrelated variables.

Finally, for our quarterly data we repeated the causal tests between GNPN on the one hand and government revenues (R), and expenditures (E) on the other.

The transformation of the logs of these variables yielded the following ARIMA models:

$$(1-B)(1+.556B) R -.086 = U_t$$

(-3.85)      (5.67)

$$(1-B)(1+.633) E -.104 = U_t$$

(-4.73)      (5.41)

$$(1-B)(1+.377B)(1-.572B^7) GNPN -.066 = V_t$$

(-2.35)      (2.77)      (44.71)

(t-statistics in parentheses ; for all variables, the correlation of the coefficients was not higher than 3.6% in any case)

By cross-correlating  $V_t$  with the  $U_t$ 's we discovered a feedback pattern between our variables. Thus we estimated transfer function models<sup>2</sup>, where GNPN was the input variable. The models we obtained yielded

$$R_t = -1.8 + 1.056 Y_t + \psi(B)u_t$$

(-6.05) (37.63)

$$E_t = -3.615 + 1.131 Y_t + \varphi(B)u_t$$

(-8.32) (34.61)

This results are almost identical to the ones that one would obtain from using simple regressions corrected for serial correlation. This is somewhat baffling and we tend to attribute it to the fact that it is the introduction of the dynamic element  $\varphi(B)u_t$  in an otherwise static model, that make the two models (OLS and Transfer Function) coincide in their results.

---

<sup>2</sup> For transfer function modelling see Box and Jenkins (1970).

## C H A P T E R V

GOVERNMENT POLICIES AND INVESTMENTA) Description of the models

Any attempt to measure the effects of the stabilization programs of the government must include an analysis of the interaction between government and private investments. This analysis has important elements for policy makers, especially in developing countries, since it incorporates long-term and short-term development strategies. Although it is clear that an increase in private investment has a positive effect on output, other things being equal, the influence the government can exert on private investment is still not well known.

There has been a great deal of empirical research as far as the determinants of private sector investments are concerned, for industrial countries. Jorgenson's neoclassical model which belongs to the flexible accelerator type models, is the most popular. The application of this model in a developing country is limited by analytical and pragmatic reasons. The economic environment in LDCs differs from the one in DCs due to the different institutional and structural elements. The differences emerge from : the absence of well-functioning financial markets, the relatively larger role of government in capital formation, and distortions created by foreign exchange constraints.



These market imperfections make the assumptions underlying the standard optimizing investment models unrealistic. Any adaptation of this kind of model to LDCs faces the constraint of the existence of reliable data. Furthermore, there are serious conceptual problems in defining private investment in sectors of the economy where state enterprises play a relatively important role; the problem is whether such enterprises should be classified as part of the public sector or part of the private sector.

In this chapter two models for investment behaviour are going to be described and estimated for the Greek case : the non-neoclassical and the neoclassical one.

Model I ,which was used by M Blejer and M Khan, 1984, to explain the investment behaviour of a group of 24 LDCs, represents an attempt to describe the private sector investment behaviour under the constraint of the unavailability of data of capital stock, labour force and wages. Although these data are available for Greece, particularly for the manufacturing sector as a whole, the unsatisfactory results derived from using a modified version of the neoclassical model urged us to use an alternative approach. Furthermore, since we intend to investigate the determinants of different categories of investment of the private sector, model I, becomes more suitable than the neoclassical one, because it does not require the availability of the two latter groups of data.

#### 1) Model I

The desired private capital stock  $KP_t^*$  can be assumed to be proportional to the expected private output,  $(YP_t^e)$  :

$$KP_t^* = a YP_t^e \quad (1)$$

This formulation assumes that the underlying production function has fixed proportions among factor inputs, so that factor prices do not enter into the specification. Using an alternative production function, we will introduce the ratio of rental price of capital to wages. (See model II, below).

To take account of the lags in the adjustment of actual investment, a partial adjustment mechanism for the capital stock can be introduced. It is assumed that the actual stock of capital adjusts to the difference between the desired stock in the  $t$  period and the actual stock in the previous period. (Lags in the actual investment are due to the time it takes to plan, built, and install new capital). So we have :

$$\Delta KP_t = \beta (KP_t^* - KP_{t-1}) \quad (2)$$

$$KP_t = \beta KP_t^* + (1-\beta) KP_{t-1} \quad (2a)$$

where :

$KP_t$  = the actual private capital stock.

$\Delta KP_t$  = net private investment.

$\beta$  is the coefficient of adjustment,  $0 < \beta < 1$

Private investment is defined as :

$$IP_t = \Delta KP_t + \delta KP_{t-1} \quad (3)$$

where  $\delta$  is the depreciation rate.

If we substitute (2) into (3) we have :

$$IP_t = \beta (KP_t^* - KP_{t-1}) + \delta KP_{t-1} \quad (3a) \text{ or}$$

$$IP_t = \beta KP_t^* + (\delta - \beta) KP_{t-1} \quad (3b)$$

If we do not want to use the variable  $KP_{t-1}$  in our model we can proceed as follows :

Defining the lag operator as  $L$  ( $LKP_t = KP_{t-1}$ ) we have from

$$(3) \quad IP_t = [1 - (1-\delta)L]KP_t \quad (4) \text{ or}$$

$$KP_t = IP_t / [1 - (1-\delta)L] \quad (5) \text{ or}$$

$$KP_{t-1} = IP_{t-1} / [1 - (1-\delta)L] \quad (5a)$$

Substituting in eq. (2a) the eq. (5) and (5a) we have

$$IP_t / [1 - (1-\delta)L] = \beta K_t^* +$$

$$(1-\beta) IP_{t-1} / [1 - (1-\delta)L] \quad (6) \text{ or}$$

$$IP_t = [1 - (1-\delta)L] \beta K_t^* + (1-\beta) IP_{t-1} \quad (7)$$

Substituting for  $KP_t^*$  in (7) we obtain

$$IP_t = \beta a [1 - (1-\delta)L] YP^e$$

$$+ (1-\beta) IP_{t-1} \quad (8)$$

Equation (8) can, also, be derived directly from defining a partial adjustment mechanism for gross investment :

$$\Delta IP_t = \beta (IP_t^* - IP_{t-1}) \quad (9)$$

In the steady state ( $KP_{t-1}^* = KP_{t-1}$ ), from (4) we have :  $IP_t^* = [1 - (1-\delta)L] KP_{t-1}^*$  (9a)

Substituting for  $IP_t^*$  into (9) and solving for  $IP_t$  we have :

$$IP_t = \beta (1 - (1-\delta)L) KP_t^* + (1-\beta) IP_{t-1} \text{ or}$$

$$IP_t = a \beta (1 - (1-\delta)L) YP_t^e + (1-\beta) IP_{t-1}$$

There are two ways to include the government's investment expenditures in the model. We can make the assumption that the government sector affects either (a) the gap between desired and actual investment (Coen, 1971), which is measured by the coefficient  $\beta$ , or (b) directly the desired level of real private investment. The first assumption makes the model consistent with the



flexible accelerator framework. Both assumptions do not change the form of the equation but alter the interpretation of the variables.

Adopting Coen's (1971) approach we argue that the coefficient of adjustment can be affected by (a) the stage of the cycle (b) the level of public sector investment and c) the availability of loans.

The effects of the stage of the cycle are not clearly well known. During the expansionary phase of the cycle demand is increased and private investors may respond more rapidly to changes in desired investment. However, if we use as an indicator of the stage of the cycle the difference between actual and full capacity or trend output we may expect the opposite effect. If actual output is above capacity the reaction of investors may be smaller because they may be constrained by the available resources (thus the result may be an increase in prices). On the other hand, if there is excess capacity, investors may respond rapidly. Moreover, Von Furstenberg (1980) notes that the cyclical response may itself involve lags arising from the difficulties in terminating ongoing investment project as demand declines and initiating investment rapidly as demand picks up.

It is argued that one of the principal constraints on investment in developing countries is the quantity rather than the cost of financial resources. It is also believed that the rate of return on investment is quite high, while the real interest rates on loanable funds are kept low by governments. This implies that the

investor is unable to equate the current marginal product of capital to its service cost. Given, that the capital markets do not exist or are not well organised and developed, the existence of credit ceilings and the absence of free or smooth adjustments, it is not far from reality to assume that the private sector investment is restricted by the level of available bank financing. It is interest to note that the majority of the models of financial development exert a positive effect of an increase in interest rates on investment, because this can result in increased financial savings and hence, the financial resources available to investors are increased.

The sources of financing private investment are limited to retained profits, bank credit, and foreign borrowing. During the period of development and under a system of credit ceilings which discriminates against certain types of investment and favors others, it may be justified to assume that the flow of bank credit is the most important source of finance. This system can lengthen the maturity of the debt by rolling over bank loans.

The relationship between private and public investment is an issue full of uncertainty both in the theoretical and empirical field. Public sector investment can cause crowding out, either by utilising scarce physical and financial resources that would otherwise be available to the private sector, or by producing marketable output that competes with private output. In addition to this the financing of the public

sector investment will lower the resources available to the private sector. ( The source of financing can be (a) taxes, (b) issuance of debt (c) inflation). On the other hand, public investment in infrastructure and the provision of public goods can clearly be complementary to private investment. This is because infrastructure investment can, (a) enhance the possibilities of private investment, by raising the productivity of capital (b) increase the demand of private output, through increased demand for inputs and ancillary services, (c) augment overall resource availability by expanding aggregate output and savings.

The above concepts imply that the overall effect of public investment on private investment depends on the relative strength and structure of the public sector investment expenditures. There is no a priori reason to decide on the complementarity or substitutability between the expenditures in question.

According to the foregoing discussion the coefficient of adjustment  $\beta$  can be expressed as a function of cyclical factors, monetary and fiscal variables :

$$\beta_t = b_0 + [ 1 / ( IP_t^* - IP_{t-1} ) ] \cdot ( b_1 GAP_t + b_2 \Delta CR_t + b_3 IG_t ) \quad (11)$$

where :  $GAP_t$  = cyclical factors, given by the difference between actual and trend output.

$\Delta CR_t$  = the change in real bank credit to the private sector.

$IG_t$  = the public sector real investment.

By substituting (11) into (9) we get the following



expression :

$$\Delta IP_t = b_0 ( IP_t^* - IP_{t-1} ) + b_1 GAP_t + b_2 \Delta CR_t + b_3 IG_t$$

from (10) and (1) we have :

$$\begin{aligned} IP_t^* &= [ 1 - ( 1 - \delta ) L ] KP_t^* \\ &= [ 1 - ( 1 - d ) L ] aYP_t^e \text{ so} \\ IP_t &= b_0 a [ 1 - ( 1 - \delta ) L ] YP_t^e \\ &\quad + b_1 GAP_t + b_2 \Delta DCR_t + b_3 IG_t \\ &\quad + ( 1 - b_0 ) IP_{t-1} \quad (12) \end{aligned}$$

An extension of (12) could be the inclusion of the change in public investment with the coefficient of change in public investment being ambiguous.

$$\begin{aligned} IP_t &= b_0 a [ 1 - ( 1 - \delta ) L ] YP_t^e \\ &\quad + b_1 GAP_t + b_2 \Delta DCR_t + b_5 \Delta IG_t + b_3 IG_t \\ &\quad + ( 1 - b_0 ) IP_{t-1} \quad (12a) \end{aligned}$$

The expression  $ab_0$  is expected to be positive and the long-run coefficient  $a$  to be close to unity. This result is expected because it is believed that in the long-run steady state the capital-output ratio would be constant.

The model can be modified to take into account investments in infrastructure. The characteristics of infrastructure can be summarised in the following lines. They have a long gestation period and inflexibility relative to the other investments that can be altered more rapidly and easily. They reflect investment programs undertaken in the past. This consideration may suggest that it would be adequate to use the trend level of public sector infrastructure investment as an explanatory variable to denote the long-run effects of infrastructure.<sup>1</sup> According to the above notions another

version of (12) could be :

$$\begin{aligned} IP_t = & b_0 a [ 1 - ( 1 - \delta ) L ] YP_t^e \\ & + b_1 GAP_t + b_2 DCR_t + b_3 IG_t^T \\ & + b_4 ( IG_t - IG_t^T ) + ( 1-b_0 ) IP_{t-1} \quad (12b) \end{aligned}$$

where :  $IG_t^T$  = the trend of  $IG_t$  or

alternatively the trend of infrastructure investment.

The sign of  $b_3$  is expected to be positive, while that of  $b_4$  could be positive or negative denoting crowding in or crowding out, respectively.

Expectations can be introduced into the model. It is argued (Blejer and Khan, 1984) that expected public investment is closer to the long-term component and would therefore affect positively private investment. The unexpected part of the public investment has ambiguous effects. To the above expected positive effect it should be added that the gestation period of each category of investment differs. Furthermore, non-infrastructure investment may have long-gestation periods and be a substitute to private investment. Thus again the expected public investment has an ambiguous effect on the investment of the private sector.

For the calculation of the expected public investment an ARIMA model can be used. M Blejer and M

---

<sup>1</sup> M. Blejer and M. Khan, 1984 who used this model introduced the trend level of public investment to represent the long-run effects of infrastructure, because there were no available data on this variable for the group of countries they examined.

Khan used a first-order autoregressive process of the form :  $GIR_t = r_0 + r_1 GIR_{t-1}$ .

The predicted values from this expression correspond to the expected values while the residuals correspond to the unexpected values.

The investment equation now becomes :

$$\begin{aligned} IP_t = & b_0 a [ 1 - ( 1 - \delta ) L ] YP_t^e \\ & + b_1 GAP_t + b_2 \Delta DCR_t + b_3 IG_t^e \\ & + b_4 ( IG_t - GI_t^e ) + ( 1 - b_0 ) IP_{t-1} \quad (12c) \end{aligned}$$

where  $IG_t^e$  is the expected public sector investment and the term  $(IG_t - IG_t^e)$  is the unexpected part of it. The coefficients are expected to have the following signs :  $b_0 a > 0$ ,  $b_1 > 0$ ,  $b_2 > 0$ ,  $b_3 > 0$ ,  $b_4 < 0$ .

To approximate the expected output we can use : (a) the distributed-lag formulation (which relates the current level of output to its past values), or b) the adaptive expectations model of Cagan's, or c) an ARIMA model.

Using Cagan's method we have :

$$\Delta YP_t^e = \lambda [ YP_{t-1} - ( 1 + g ) YP_{t-1}^e ] \quad (13)$$

where  $\lambda$  is the coefficient of expectations  $0 < \lambda < 1$ ,  $g$  is the growth rate of output.

The expression can be rewritten to solve for  $YP_t^e$  :

$$\begin{aligned} YR_t^e \{ 1 - L [ 1 - \lambda ( 1 + g ) ] \} &= \lambda YP_{t-1} \text{ or} \\ YP_t^e &= \lambda YP_{t-1} / \{ 1 - L [ 1 - \lambda ( 1 + g ) ] \} \quad (14) \end{aligned}$$

Substituting the last expression into the investment equation we have :

$$\begin{aligned} IP_t \{ 1 - L [ 1 - \lambda ( 1 + g ) ] \} &= \lambda b_0 a [ YP_{t-1} - ( 1 - \delta ) YP_{t-2} ] \\ &+ \{ 1 - L [ 1 - \lambda ( 1 + g ) ] \} \end{aligned}$$



$$[ b_1 \text{ GAP}_t + b_2 \Delta \text{DCR}_t + b_3 \text{ IG}_t + (1-b_0) \text{ IP}_{t-1} \quad (15)$$

Equation (15) can be rewritten to take into account the previously mentioned trend and expected values.

The model is nonlinear in parameters. It can be estimated by a restricted least squares method that permits identification of the individual parameters. The nonlinearities are caused by  $\lambda$ ,  $g$ ,  $\delta$ . The coefficient  $\lambda$  can be calculated by choosing that value of  $\lambda$  which maximises the log-likelihood function under the restriction  $0 < \lambda < 1$ . If data on the capital stock exist  $\delta$  can be estimated by regressing depreciation at constant prices on the initial capital stock :

$$\text{DP} = a_0 + a_1 \text{ KP}_{t-1} \quad (16)$$

where DP is depreciation and  $a_1$  is the rate of depreciation. In the case where  $\delta$  can not be estimated due to unavailability of data an arbitrary value must be used. The rate of growth can be estimated by the expression  $\text{YP}_t = \text{YP}_0 e^{gt}$ , where  $\text{YP}_0$  is the actual level at the beginning of the period.

If an ARIMA model is used for the determination of the expected output we avoid the need of using an arbitrary value for  $\delta$ . In that case we can use a least squares method and find the value of  $\delta$  that maximises the log-likelihood function, given that  $0 < \delta < 1$ .

## 2) Model II (The neoclassical approach)

In this section we describe a model for investment behaviour developed by Sudarjan and Thakur, 1980 which is consistent with the neoclassical theory of investment, as developed by Jorgenson.

Jorgenson's model uses the flexible accelerator

approach of investment with the capital/output ratio varying with the relative price of capital input. The justification of using this kind of model, according to the authors, comes from the belief that the assumptions embodied in the neoclassical theory are not essential to the propositions of the theory. These assumptions which are hardly applied in a developing country with nonprice rationing mechanisms, can be summarised as follows :

- a) maximization of rates of return by economic agents,
- b) existence of perfect market of goods, c) well developed financial markets.

The neoclassical theory suggests that private investment depends positively on the expected output level and negatively on the relative price of capital which is the user cost of capital relative to the wage rate. The traditional flexible accelerator model stresses the reaction of capital stock to output. Furthermore the capital stock is assumed to adjust to its desired level with a lag.

According to the model of Thakur, the desired level of capital is determined by minimising total cost (TC). This specification is derived from the Hall's (1977) argument which states that the assumption that firms maximize their profits is not necessary for deriving the neoclassical investment function while the assumption that firms minimize total cost is sufficient.

Total cost is defined as the discounted present value of future costs including the costs of production and the cost of acquiring capital. The cost of producing the planned private sector output  $Y_{Pt}^e$  depends on

planned output, the plant size which is approximated by the private capital stock and the available infrastructure represented by the public sector public capital stock. The cost of acquiring capital depends on the current value of net and replacement investment (the sum of which is the gross fixed investment). This cost is the part of the total cost which can include also the purchasing cost, the costs of installation and other costs. Data on these variables do not exist and so they are ignored.

According to the above assumptions we have the following relations :

$$TC = C_t ( YP_t^e, KP_t, KG ) \quad (17)$$

$$IP = PI ( \Delta KP_t + \delta KP_t ) \quad (18)$$

Where : PI is the price of capital goods.

IP is the gross fixed private investment  
at current prices.

All the other variables are defined in the previous section.

The following equation must be minimized :

$$TC = \int_0^{\infty} \exp(-\int_0^t R(s)ds) [C_t(YP_t^e, KP_t, KG_t) + PI(\Delta KP_t + \delta KP_t)] dt \quad (19)$$

The right hand term represents the discounted present value of future costs, where  $\int_0^t R(t)ds$  is the long-term discount rate which is the integral of short-term rates.

The Euler condition for minimization is given by

$$\partial TC / \partial KP_t - d/dt(\partial TC / \partial \Delta KP_t) = 0 \text{ or}$$

$$\exp(-\int_0^t R(s)ds) [(\partial C_t / \partial KP_t) + (PI_t \delta)] -$$

$$d/dt[\exp(-\int_0^t R(s)ds) PI_t] = 0 \text{ or}$$

$$\exp(-\int_0^t R(s)ds) [(\partial C_t / \partial KP_t) + (PI_t \delta) -$$



$$\Delta PI_t + (PI_t R(t)) = 0 \quad (20)$$

Note that  $\Delta$  is used for the approximation of the first derivative of the variables.

Rewriting the last expression to express the first order condition we have :

$$\partial C / \partial KP = U(t) \quad (21)$$

where  $U(t)$  is the user cost of capital

$$U(t) = PI_t [R(t) + \delta] - \Delta PI_t \quad (22)$$

Equation (21) implies that capital should be acquired in the current period until the reduction in present and future costs owing to a unit of additional capital equals the current user cost of capital.

The variable cost function can be derived by assuming that the production function is Cobb-Douglas :

$$YP_t = A_t (KG_t)^{a_0} (KP_t)^{a_1} (L_t)^\beta \quad (23)$$

Where  $A_t > 0$ ,  $a_0 > 0$ ,  $a_1 > 0$ ,  $\beta > 0$ , and  $L_t$  stands for labor input,  $A_t$  for the effects of shifts in the production function owing to technical progress.

The variable cost function is :

$$C_t = W_t L_t = W_t (YP_t)^{1/\beta} (A_t)^{-1/\beta} (KG_t)^{-a_0/\beta} (KP_t)^{-a_1/\beta} \quad (24)$$

Differentiating the cost function with respect to  $KP_t$  and substituting in the Euler condition we get :

$$W_t (YP_t)^{1/\beta} (A_t)^{-1/\beta} (KG_t)^{-a_0/\beta} (-a_1/\beta) (KP_t)^{-(a_1/\beta)-1} = U_t \quad (25)$$

Solving for  $KP_t$  we can obtain the desired capital stock which corresponds to the expected or planned output level  $YP_t^e$  :

$$KP_t^* = \text{con } (U_t/W_t)^{-\beta/(a_1+\beta)} (KG_t)^{-a_0/a_1+\beta} (YP_t^e)^{1/(a_1+\beta)}$$

(26)

If  $a_0 > 0$  the equation implies that an increase in public sector capital stock will reduce the private sector capital requirements. The increase in public capital stock lowers the cost of producing private sector output. Public investment provides some of the facilities that the private sector would have to provide for itself in the absence of public investment. An increase in rental wage ratio  $U_t/W_t$  reduces the desired capital stock owing to capital labor substitution. It is believed, however that it is the expected rental wage ratio that determines the expected capital stock.

Linearizing (26) we get :

$$KP_t^* = d_0 - d_1 (U_t/W_t)^e + d_2 YP_t^e - d_3 KG_t \quad (27)$$

The planned private output depends on the current and past values of private output and on the public sector capital stock. Thus we have

$$YP_t^e = A_0 + a(L) YP_t + A_1 KG_t \quad (28)$$

Where  $a(L)$  ( $YP_t$ ) is the lag operator and  $A_1 > 0$ .

The partial adjustment of the private sector actual capital stock is given by :

$$KP_t - KP_{t-1} = \beta'_t (KP_t^* - KP_{t-1}) \quad (29)$$

The speed of adjustment  $\beta'_t$  depends on the easiness with which private investment can be financed :

$$\beta'_t = \beta'_0 + \beta'_1 [((S_t - IG_t)/PI_t)/(KP_t^* - KP_{t-1})], \quad \beta'_1 > 0 \quad (30)$$

where  $S_t$  is the aggregate savings.

Substituting into the private sector investment function,  $IP_t = (KP_t - KP_{t-1}) + \delta KP_{t-1}$ , the equations (27) (28) (29) (30), we obtain the private sector investment function :

$$IP_t = B_0 + B_1 (U_t/W_t)^e + B_2 a(L) YP_t + B_3 KG_t + B_4 [(S_t - IG_t)/PI] + B_5 KP_{t-1} \quad (31)$$

Where  $B_0 = \beta'od_0 + \beta'od_2 A_0$ ,  $B_1 = -\beta'od_1$ ,  $B_2 = \beta'od_2$

$B_3 = -\beta'od_3 + \beta'od_2 A_1$ ,  $B_4 = \beta'_1$ ,  $B_5 = \delta - \beta'_0$ , and

$B_2 > 0$ ,  $B_4 > 0$ ,  $B_1 < 0$ ,  $B_5 > 0$ ,  $B_3 > 0$

The sign of  $B_3$  is indeterminate. This is because it combines the positive effect on the expected output of the private sector. If the public sector is expanding in sectors in the economy which the private investment has the major part it may reduce the planned sector output, if it is considered that private and government investments are substitutes. However this issue is an empirical one.

The term which represents the total financing available to the private sector  $(S_t - IG_t)$ , is used to capture the financial crowding out and b) the real resources crowding out.

The government and the private sector may compete with each other for real resources such as cement, steel or imported materials. This competition may lead to crowding out because of the controls on the imported goods and the licensing restrictions, that are used widely. Furthermore, this term includes also the availability of self-financing which may be important especially under credit rationing.

To make our analysis complete and consistent with the assumptions underlying the already discussed models we present models of financially repressed economies.

#### B) Models of financially repressed economies.

These models incorporate important elements of the



determinants of private investments and the crowding out issue.

Financial repression can be defined as the technique of holding interest rates below their free market equilibrium levels. These kind of models try to analyse the behaviour of the investment, savings, and growth functions in economies with the following main characteristics.

Money and banking systems are favoured and protected - high reserve requirements and obligatory holdings of government bonds can be imposed to tap this source of saving at zero or low interest cost to the public sector. Private bond and equity markets are suppressed through transactions taxes, stamp duties, special tax rates on income from capital. Interest rate ceilings are imposed to stifle competition from the private sector. Furthermore, foreign exchange controls interest rates ceilings high reserve requirements, suppression or nondevelopment of private capital markets can all increase the flow of domestic resources to the public sector without a concomitant rise in inflation or interest rates.

Financial restriction affects the demand for money in the following ways. It shifts the function to the right and increases income. It lowers cost elasticities and the velocity of circulation.

These effects allow for a greater public sector deficit to be financed at a given rate of inflation and a given level of nominal interest rates. Financial restriction is consistent with sectoral or selective

credit policies. The former necessitates the latter, since financial liberalization enables financial channels to develop expressly for rerouting subsidized credit. For selective credit policies to work at all, financial markets, must be kept segmented and restricted.

These policies can become highly destabilizing in the face of inflationary shocks, since they lead to a shift from financial to tangible assets when inflation accelerates. This shift is caused by negative interest rates due to the low fixed nominal institutional interest rates relative to the inflation rate.

The Mckinnon-Shaw model, 1973 is illustrated in the following figure. (Other models have been developed, but since Mckinnon and Shaw were the first to capture the issues of financially repressed economies, their model is chosen for a summary of the most important issues.)

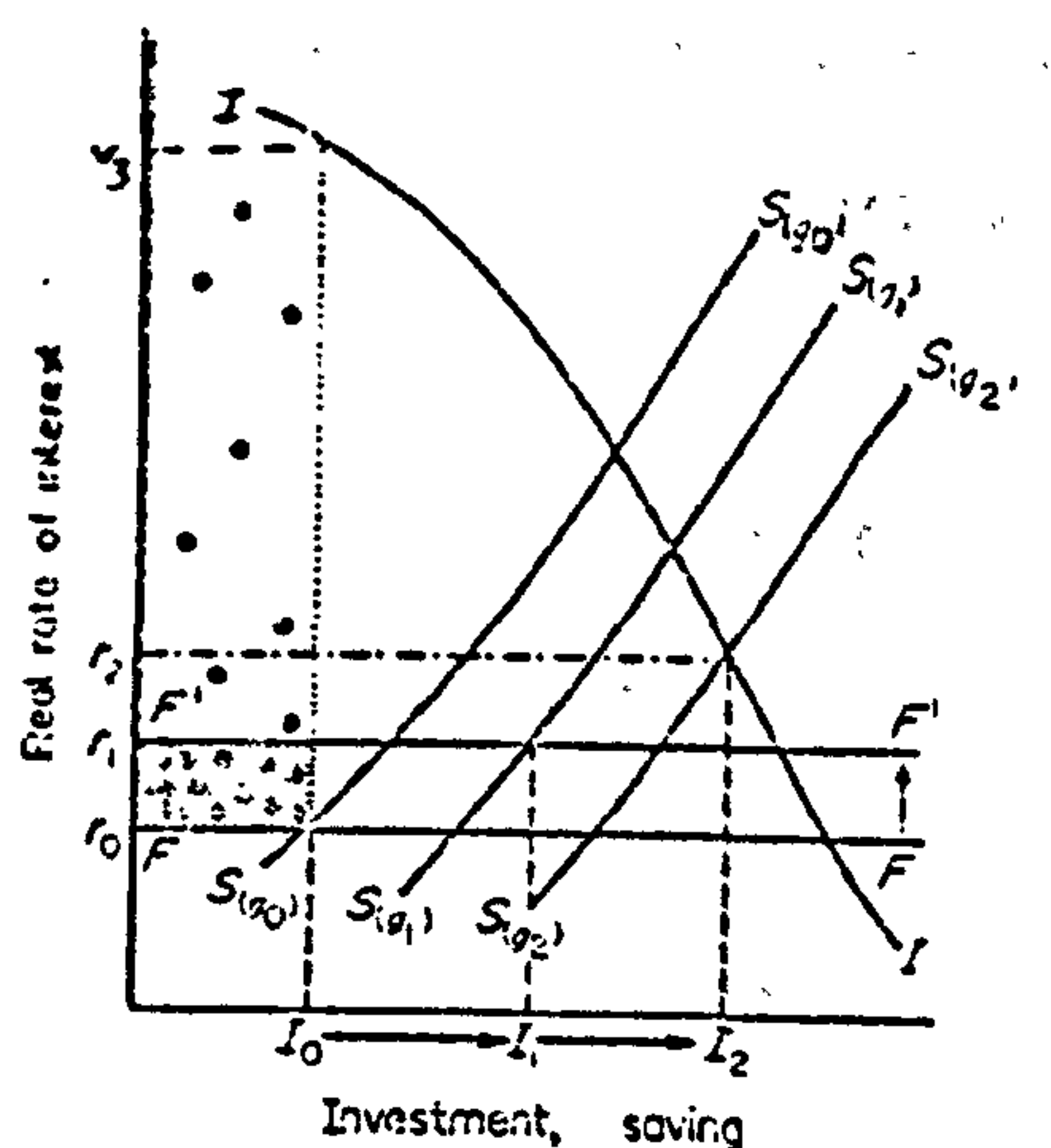


Figure V-1

Models of financially repressed economies.

According to Figure V-1, saving  $S(g_1)$  at a given

rate of economic growth  $g_1$ , is a function of the real interest rate  $r$ .  $F$  stands for financial repression defined as an administratively determined interest rate, which holds the real rate below its equilibrium level.

For the saving function  $S_g$ , the actual investment is  $I_0$  corresponding to the real interest rate  $r_0$ . Loan rate ceilings imply non-price rationing of loanable funds. Risk-taking on the part of financial institutions is discouraged and this means that risk premia cannot be charged when ceilings are binding and effective. This itself rations out a large proportion of potentially high yielding investments. It is possible therefore that the investments are financed to yield returns barely above the ceiling interest rate  $r_0$ . These are shown in the figure by the dots lying just above  $FF$  in the shaded area. If the interest rate ceiling increases to  $r_1$  there will be an increase in saving and investment. At the same time it rations out all the low yielding investments, illustrated by the dots in the shaded area, which were financed before. They yield a rate of return above  $r_0$  but below  $r_1$  and they are not profitable anymore. Therefore the average efficiency of investment increases. At the same time the rate of growth of output increases and this shifts the saving curve to the right.

McKinnon's analysis of the interdependence between real deposit rate, saving, investment, and growth can be summarised in the following two equations.

$$M/P = f(Y, I/Y, d - \pi^*) \quad (32)$$

$$I/Y = f(r^t, d - \pi^*) \quad (33)$$

Where,



$M/P$  = The real money stock broadly defined.

$Y$  = Real GNP.

$I/P$  = The ratio of gross investment to GNP.

$\pi^*$  = The expected inflation rate.

$r^t$  = Rate of return in investment.

$d$  = Interest rate on deposits.

$d - \pi^*$  = Real interest rate.

$$\partial(M/P)/\partial(I/Y) > 0 ; \partial(I/Y)/\partial(d - \pi^*) > 0 \quad (34)$$

The complementarity between money and capital rests on the following assumptions.

a) There are no financial intermediaries.

b) Indivisibilities in investment are of considerable importance. This assumption implies that money balances must be accumulated prior to investments. The more attractive the process of accumulating money the higher the real deposit rate of interest the greater the incentive to invest. The relative lumpiness of investment expenditures implies that aggregate demand for money will be greater, the larger the proportion of investment in total expenditures.

Shaw's model drops the assumption of no financial intermediaries. If interest rates are administratively fixed below their equilibrium level higher interest rates increase incentives to save and invest and raises the average efficiency to invest. Complementarity has no place here because investors are not constrained to self-finance. Thus equation (32) becomes

$$M/P = f(Y, v, d - \pi^*) \quad (33), \text{ where } v \text{ is the opportunity cost in real terms.}$$

The structure of the public sector expenditures can

become important under inflationary pressures. Inflation affects adversely productive investments by increasing the cost of production and favoring less productive investments with lower costs and increasing rates of return to investors (investments in residential buildings). Governments react to inflationary shocks by reducing expenditures. However for a developing country this may have adverse effects to the whole economy. Reducing expenditures especially in investments can be a constraint to the future aggregate supply of goods. Assuming that the fiscal policy is effective for demand management boosting aggregate supply and reducing the rates of inflation presupposes a change in the structure of the government expenditures as well as a reduction in the size of government expenditures and the public deficit. A change in the structure of public expenditures which favours investment expenditures ( or infrastructure expenditures) can relax the supply constraints and the inflationary pressures given the factors that affect the economic environment.

#### C) Private and public investment in Greece.

Tables V-1,V-2 show the private and government investments and its components as a percentage of real GDP, for the period 1953-81, where

- I = Total investments.
- IP = Total private investments.
- IG = Public sector investment.
- IE = Public sector investment in energy.
- IT = Public sector investment in transporation and communication.

IF = Public sector investment in infrastructure.

( IE+IT+ public investment in agriculture).

IAG = Public investment in agriculture.

CONG = Public consumption expenditure.

CURG = Current expenditures of the ordinary budget of  
the central government.

IM = Private investment in machinery and equipment  
in manufacturing.

ITR = Private investment in trade.

IR = Private investment in residential building.

IAP = Private investment in agriculture.

IRES = The rest of the private investment in other  
than the above mentioned sectors .

$\Delta \log p$  = The inflation rate.

p = The consumer price index.

(All the variables are at constant prices and are  
expressed as percentages to real GDP).



Table V-1

Various groups of private and public expenditure as percentages of GDP

Year	I	IP	IG	IE	IT	IF	IAG	CONG	CURG
1953	15.61	11.12	4.50	1.49	0.56	2.59	0.54	15.47	17.17
1954	15.29	11.03	4.26	1.51	0.61	2.62	0.50	16.26	18.01
1955	15.86	11.55	4.31	1.33	0.67	2.37	0.37	15.84	17.37
1956	17.75	12.68	5.07	1.35	0.80	2.64	0.49	17.23	16.56
1957	16.50	11.78	4.73	0.91	1.07	2.66	0.68	15.77	15.91
1958	20.06	14.50	5.56	1.38	1.61	3.97	0.98	15.85	15.36
1959	20.16	13.54	6.63	1.81	1.82	4.70	1.08	15.42	15.66
1960	22.54	14.91	7.63	1.52	2.69	6.00	1.79	15.87	15.39
1961	21.89	13.70	8.19	1.47	2.65	6.10	1.97	14.89	15.49
1962	23.59	15.36	8.24	1.86	2.45	6.12	1.81	15.79	16.20
1963	22.68	15.49	7.19	1.64	2.34	5.66	1.68	14.94	16.22
1964	25.38	18.01	7.37	2.17	2.69	6.20	1.34	15.19	17.09
1965	26.20	18.75	7.45	2.45	2.71	6.24	1.07	15.15	17.72
1966	25.67	18.58	7.08	1.91	2.52	5.59	1.16	15.28	18.02
1967	24.19	16.69	7.50	2.50	2.53	6.03	0.99	15.84	20.00
1968	27.72	20.13	7.59	2.47	2.89	6.38	1.02	15.19	20.85
1969	30.08	21.45	8.63	2.82	3.12	7.15	1.21	14.96	20.63
1970	27.39	19.67	7.72	1.94	3.07	6.35	1.34	14.63	20.02
1971	28.92	19.79	9.14	2.61	3.59	7.47	1.27	14.22	19.84
1972	30.59	21.09	9.49	2.57	3.66	7.59	1.36	13.77	19.94
1973	30.38	21.90	8.48	2.56	3.05	6.83	1.21	13.57	18.49
1974	23.04	16.15	6.89	2.47	2.24	5.52	0.82	15.49	20.58
1975	21.97	15.80	6.17	1.71	1.95	4.49	0.82	16.50	23.13
1976	22.13	16.20	5.93	1.59	1.92	4.29	0.78	16.36	23.51
1977	23.17	17.99	5.17	1.43	1.55	3.69	0.71	16.93	24.80
1978	22.80	17.60	5.19	1.45	1.46	3.52	0.61	16.46	24.44
1979	24.02	18.46	5.56	1.71	1.76	4.05	0.58	16.82	25.35
1980	21.54	16.20	5.34	1.61	1.87	3.98	0.49	16.55	24.49
1981	19.40	14.08	5.32	1.36	2.02	3.83	0.45	17.71	28.10

Source: Center of Planning and Economic Research (the first seven columns). "The Greek Economy" ed. Bank of Greece (the last two columns).

According to table V-1, an upward trend characterises all the investment ratios up to 1972-73. These years coincided with the peak ratios of the aggregate investment in both the private and public sector. The downward trend which started from 1974 and 1973 for the private and public investment respectively had as a result to bring the ratios of investments in both sectors down to their before 1960 levels. In particular, total investment amounted to 30% of GDP in 1973 and 19.4% in 1981 which is even below the 1958

Table V-2Various groups of private investment as percentages of GDP

Year	IM	ITR	IR	IRES	IAP	ΔLP
1953	4.10	1.14	6.12	3.08	0.72	...
1954	3.57	1.23	5.95	2.86	0.84	5.00
1955	3.30	1.34	6.03	3.16	0.89	5.72
1956	2.11	1.55	6.02	3.80	1.07	3.68
1957	1.84	1.15	5.21	3.56	1.55	2.30
1958	1.93	1.26	6.19	4.91	1.82	1.43
1959	1.92	1.27	5.84	4.33	1.99	2.41
1960	1.89	1.53	6.39	4.74	2.13	1.57
1961	2.51	1.38	6.21	4.23	1.76	1.93
1962	2.23	1.58	7.03	5.14	1.44	-0.38
1963	1.98	1.76	6.98	4.98	1.55	2.86
1964	2.29	1.74	7.89	6.15	1.98	0.93
1965	2.44	1.55	8.17	6.61	2.15	3.12
1966	2.42	1.43	7.74	7.48	1.68	4.98
1967	2.94	1.20	6.60	6.57	2.02	1.69
1968	2.97	1.47	8.77	7.38	2.23	0.33
1969	3.00	1.03	9.59	8.64	1.92	2.49
1970	2.70	0.92	7.54	9.22	1.57	2.92
1971	3.18	0.81	8.24	8.49	1.62	2.99
1972	3.11	0.58	9.64	8.94	1.58	4.28
1973	3.41	0.83	9.18	9.79	1.73	15.54
1974	3.81	0.99	4.85	8.56	1.35	26.90
1975	4.19	0.63	5.94	7.42	1.48	13.40
1976	4.31	0.82	5.99	7.65	1.37	13.32
1977	4.18	1.22	7.05	7.96	1.52	12.14
1978	3.59	1.08	7.56	7.46	1.21	12.56
1979	3.41	1.38	7.64	7.89	1.28	18.99
1980	3.27	1.01	6.46	7.44	0.99	24.87
1981	3.39	0.83	5.01	6.84	0.90	24.48

Source: Center of Planning and Economic Research.

level. The private investment ratio was 21.9% and 14% in 1973 and 1981 respectively, the latter being almost equal to its 1961 ratio. Similarly, the public investment ratio was 9.5% and 5.3% in 1972 and 1981 respectively, while in 1958 the same ratio was 5.5%. Examining the columns that present the components of public investment, we clearly see that the downward trend in total public investment was accompanied by a downward trend in public investment in infrastructure and its components. Moreover, according to the last two columns the ratios of the consumption expenditures of the public



sector and the current expenditures of the central government were increased after 1973. Thus, after the first oil crisis and the emergence of inflationary pressures, as shown by the last column of table V-2 there was a reduction in investment expenditure of the public sector at the expense of current and consumption expenditures.

As far as the private investment ratios are concerned investment in manufacturing after achieving its peak in 1975 (4.31%), was reduced to 3.4% in 1981. Likewise, according to table V-2 the investment ratios for residential investment and the rest of the economy after their peak levels in 1972 and 1973, respectively, were reduced, though not so significantly as the ratios of public investments. Finally, investment in trade and in agriculture continued its downward trend after 1970 and 1968, respectively.

The last column of table V-2, which presents the inflation rate, measured as the rate of increase in the consumer price index, shows the high inflationary pressures prevailing during the period 1973-81.



D) The model for the Greek economy.

In order to examine the role of the government investment in the private sector investment decision, empirically, we disaggregated the private sector investments into six categories :

- 1) Investment in machinery and equipment in the manufacturing sector.
- 2) Investment in buildings in manufacturing
- 3) Residential buildings investments.
- 4) Investment in the agricultural sector.
- 5) Investment in the trade sector and
- 6) Investment in the rest of the private sector

The public sector investment expenditures were also broken down into their components to investigate their relative influence on the private sector's investment.

The model that was used to estimate the investment equations was modified in the following way.

Starting from eq. (9) and using the logs of the variables we have :  $\Delta \log IP_{it} = \beta (\log IP_{it}^* - \log IP_{it-1})$  (9a)

In addition we approximate eq. (3) by :

$$\log IP_{it}^* = a_0 + a_1 \log KP_{it}^* - a_2 \log KP_{it-1}^* + a_3 \log (\delta KP_{it-1}^*) \text{ or}$$

$$\log IP_{it}^* = a_0 + a_2 \log KP_{it}^* - (a_2 - a_3 \delta_1) KP_{it-1}^* \quad (3c)$$

The coefficient  $\beta$  was determined in the following way :

$$\beta_t = b_0 + [1 / (\log IP_{it}^* - \log IP_{it-1})] (b_1 \text{GAP}_t + b_2 \log \Delta CP_t + b_3 \log IG_t + b_4 \text{INF} + c_1 \log X_1^e) \quad (34)$$

where  $IP_{it}$  stands for private investment in category  $i$  and  $X_1^e$  represents the expected private investment in other categories than  $IP_{it}$ .  $\text{GAP}$  equals  $\log Y_{t-1} - \log Y_t^T$ .

The  $\log Y_{t-1}$  was used instead of  $\log Y_t$  to indicate the lags that are involved in the response of investment to

the cyclical factor.  $\delta_1$  is the log of  $\delta$ . INF is the ratio of actual to anticipated inflation. The reason for this variable to be included into the model comes from the extension of the expectations-augmented Phillips curve. If actual inflation exceeds expected price, entrepreneurs interpret the difference to reflect a real increase in the demand for their products. It is expected that their response is to raise the rate of capacity utilization of existing capital to increase output immediately and to invest more to increase capacity. Thus  $b_4$  is expected to have a positive sign. The variable  $x_{jt}^e$  was used to examine the substitutability or complementarity between investment in manufacturing and in the various categories of the private investment. More specifically, it is argued that part of the loans offered to private investors in manufacturing were channelled to other investments such as housing or other kinds of property, and into trade. To this we should add that it is a quite reasonable investment decision in certain categories to depend on the buoyancy of investment in other sectors, since the products of the former can be used as inputs to the latter sectors. This is particularly true for the manufacturing sector and investment in residential buildings.

Substituting equations (34) (3c) and (1) into (9a) and rearranging we have :

$$\begin{aligned} \log IP_{it} = & A + b_0 a_1 \log YP^e - b_0 (a_2 - a_3 \delta_1) \log YP_{t-1} + (1-b_0) \\ & IP_{it-1} + b_1 GAP_t + b_2 \log \Delta CP_t + b_3 \log IG_t + b_4 INF \\ & + c_i \log X_i^e \quad (35) \end{aligned}$$



The equation for the investment in residential buildings was modified, also in the following way. The rate of return on investment in residential buildings was included as an explanatory variable along with the real expected deposit interest rate. The reason for the additional explanatory variables in this category of investment rest on the following.

The household sector especially after 1970 showed a strong preference to invest in residential buildings. Given the underdevelopment of capital markets, its portfolio consisted of money holdings and investment in buildings. Given the low real interest rates, especially after the emergence of inflationary conditions and the fact that the real returns to invest in residential buildings moved with the same pace as the inflation rates, a move towards less money holdings and more investment housing was unavoidable. At the same time the other sectors of the economy which rest for their financing on the banking system of the economy could have been deprived of financial resources because of the reduction in money savings. Thus, the rate of return of residential buildings is expected to have a positive effect on this kind of investment. On the other hand the real deposit rate can have a positive or negative effect, depending on the complementarity or substitutability between investment in residential buildings and money holdings. The complementarity can be understood if we consider the need to accumulate money savings prior to investment in residential buildings. Using these transformation and the alternative



specifications for  $IG_t$  as were described by equations (12a, b, c), we estimated the investment equations shown in the following section.

#### E) The empirical results.

The equations described above were estimated using annual data covering the 1953-81 period. The regressions were estimated using the OLSQ method. All the expected values for our variables were calculated by fitting ARIMA models to them and then taking the systematic part as representing the expected part. An ARIMA model is a univariate process where one variable is expressed as a function of its past and a residual term which is white noise. Thus, an ARIMA model has the general form  $X_t = \phi(B)X_t + \theta(B)u_t$ , and we assume that the expected values of  $X_t$  are given by  $X_t^e = X_t - u_t$ . This method of finding expected values seems, in our opinion, more parsimonious and effective than other methods which have been in use until now such as polynomial distributed lags of various forms, since it is less arbitrary as to the length of the lags and the degree of the polynomial. Also, if we were to use polynomial distributed lags or the adaptive expectations approach for our (independent) variables, then we would be introducing a high degree of non-linearities in our model, which in turn would result to difficulties in its convergence and a possible requirement for imposing certain coefficients, and this is something we would like to avoid. Moreover, different specifications for the credit variable were used i.e, the real credit, the change and/or the rate of change of it (for a detailed description of the use of these

variables see Fry (1980). The latter two variables were used in natural numbers not in logs because this specification gave the best statistical results. The output of the whole of the economy was used instead of the private output, representing in this case the demand of the whole economy. This variable gave the most satisfactory result, as far as the goodness of fit was concerned along with the right signs of the explanatory variables. Furthermore, its use instead of the private output has been justified by many empirical studies. Tables V-3 to V-15 present the most satisfactory results we obtained from the estimated regressions according to the goodness of fit of the regressions under consideration.

The variables used are :

LIM = Private investment in machinery and equipment in manufacturing.

LIA = Private investment in agriculture.

LITR = Private investment in trade.

LIR = Private investment in residential buildings.

LIBM = Private investment in buildings in manufacturing.

LIRE = The rest of the private investment in other than the above mentioned sectors .

LCR1 = Credit to manufacturing divided by the IM deflator.

LCR2 = Credit to agriculture divided by the IA deflator.

LCR4 = Credit to residential buildings divided by the IR deflator.

LCR3 = Credit to the rest of the economy devided by  
the IRES deflator.

LIG = Public sector investment.

LIE = Public sector investment in energy.

LIT = Public sector investment in transporation and  
communication.

LIF = Public sector investment in infrastructure.  
(IE+IT+ public investment in agriculture).

LIO = Public sector investment other than in  
infrastructure.

INF =  $\pi/\pi^e$

$\pi$  = The inflation rate,  $\Delta \log p$ ,

$p$  = The consumer price index.

LY = Real GDP.

The L in front of the variables stands for the logarithm. The superscripts T and e represent the trend and expected values of the corresponding variables, respectively, while  $\Delta$  is their change. All the investment variables are in constant prices. The expected inflation rate was approximated by the last year's rate.

The estimated arima models are :

$$(1-B) \text{ LIRES } -.083 = U_t \quad (36) \\ (3.31)$$

$$(1-B)(1-.572) \text{ LIT } -.042 = U_t \quad (37) \\ (3.55) \quad (2.74)$$

$$(1-B) \text{ LIF } -.027 = U_t \quad (38) \\ (2.65)$$

$$(1-B) \text{ LIE } -.051 = U_t \quad (39) \\ (2.72)$$

$$(1-B) \text{ LY } -.054 = U_t \quad (40) \\ (9.25)$$



$$(1-B) \text{ LIG} - .060 = U_t \quad (41)$$

(2.69)

$$(1-B) \text{ LIM} - .053 = U_t \quad (42)$$

(2.97)

$$(1+.389B) \text{ LIBM} - .184 = U_t \quad (43)$$

(-2.81)                  (3.98)

$$(1-B) \text{ LIR} - .047 = U_t \quad (44)$$

(2.87)

$$(1-.930B) \text{ LITR} - .539 = U_t \quad (45)$$

(9.76)                  (13.12)

$$(1-.58B) \text{ LIO} - .64 = U_t \quad (46)$$

(2.34)                  (4.09)

The trend values of the variables were calculated from the following estimated regressions :

$$\text{LY} = 11.3 + -.055 \text{ D60} - .068 \text{ D62} \quad (47)$$

(80)                  (2)                  (2)

$$+ (.063 - .0027 \text{ D7579} - .0063 \text{ D8081}) \text{ T}$$

(62)                  (3)                  (7)

$$\bar{R}^2 = 99\% \text{ SE} = .0287$$

$$\text{LIG} = 8.24 + (.098 - .026 \text{ D7579} - .037 \text{ D8081}) \text{ T} \quad (48)$$

(116)                  (16)                  (7)

$$\bar{R}^2 = 93 \text{ SE} = .153$$

$$\text{LIF} = 7.4 + .29 \text{ D5363} + (.13 - .042 \text{ D7579} - .05 \text{ D8081}) \text{ T} \quad (49)$$

(35)                  (2)                  (11)                  (8)                  (8)

$$\bar{R}^2 = 93\% \text{ SE} = .172$$

$$\text{LIE} = 6.9 + (.10 - .03 \text{ D7579} - .037 \text{ D8081}) \text{ T} \quad (50)$$

(100)                  (19)                  (7)                  (7)

$$\bar{R}^2 = 94\% \text{ SE} = .155$$

$$\text{LIT} = 6.3 + (.2 - .044 \text{ D6472} - .93 \text{ D7378} - .01 \text{ D8081}) \text{ T} \quad (51)$$

(40)                  (8)                  (3)                  (4)

$$\bar{R} = 72\% \text{ SE} = .351$$

$$\text{LIO} = 7.24 + .050 \text{ T} \quad (52)$$

(87)                  (10)

$$\bar{R}^2 = 80\% \text{ SE} = .217$$

The D's in the above regressions are dummy vari-

ables which take the value of one according to the year or the period of years as indicated by the number after the D and the value of zero in all other years (e.g. D7579 is a dummy variable which takes the value of one between the period 1975-79, and zero elsewhere). The dummy variables were used to indicate either a shift in the actual level of the expenditures or a change in the rate of growth. The regressions for the calculation of the trend variables were estimated by the non-linear LSQ method.

Given the number of regressions and the variety of the investment categories the results as shown in Tables V-3 to V-15 imply that the models are well specified and fit the data quite satisfactorily. The coefficients of the output variable have the correct sign and are significantly different from zero at the 1 percent level of significance. The sum of the coefficients of the lagged output in every equation was positive and significantly different from zero. Thus the total output effect is positive (note that the above equations have been corrected for first-order serial correlation since the inclusion of the lagged dependant variable would bias the D.W. statistic towards the value of 2).

Moreover we found that it is the previous year's expected output that has a statistically significant effect, instead of the current expected output. The cyclical factor have a significant negative effect in almost every equation. It indicates that private investments are positively related to the degree of capacity in the economy. When the economy operates above its

Table V-3

Dependent variable : LIM

EQ	CONS	LY <sup>e</sup> <sub>t-1</sub>	LY <sup>e</sup> <sub>t-2</sub>	GAP	ΔLCR1	LIG	LIG <sup>T</sup>	LIG-LIG <sup>T</sup>	ΔLIG	LIG <sup>e</sup>	LIG-LIG <sup>e</sup>	LIM <sup>e</sup> <sub>t-1</sub>	LIR <sup>e</sup>	LIRA <sup>e</sup>	LIBM <sup>e</sup>	INF	R <sup>2</sup>	SE
(1)	-1.67 (12)	.32 (2)	-.14 (2)	-.05 (4)	.32 (33)				.28 (28)	.063 (3)	.62 (36)				.063 (36)	.97	.105	
(2)	-.3 (13)	.43 (6)	-.10 (1.5)	-.32 (5)	.30 (28)				.34 (28)	.031 (2)	.60 (35)				.08 (8)	.012 (11)	.97	.107
(3)	-.3 (20)	.63 (9)	-.10 (1.7)	-.50 (8)	.21 (19)				.27 (30)	.037 (2)	.44 (23)		-.19 (17)		.012 (13)	.97	.102	
(4)	-1.7 (12)	.58 (8)	-.40 (6)	-.51 (6)	.30 (27)		.16 (12)	.35 (23)			.75 (45)				.05 (5)	.96	.107	
(5)	-.1 (6)	.47 (6.5)	-.39 (5.5)	-.87 (9)	.28 (25)		.08 (4)	.33 (21)			.79 (45)	.10 (8)			.07 (7.5)	.97	.109	
(6)	-.8 (3)	.49 (7)	-.37 (5)	-.47 (6)	.3 (26)		.13 (8)	.35 (23)			.75 (44)			.04 (4)	.06 (6)	.97	.110	
(7)	-2.8 (17)	.83 (11)	-.37 (5)	-.7 (9)	.23 (19)		.18 (15)	.29 (6.7)			.59 (29)		-.15 (12)		.06 (6.7)	.97	.107	
(8)	-1.7 (11)	.56 (8)	-.4 (6)	-.11 (1.7)	.34 (33)	.24 (24)			-.01 (7)		.7 (38)				.06 (5)	.97	.109	
(10)	-1.4 (7.9)	.51 (6.4)	-.4 (5.2)	-.14 (2)	.35 (32)	.22 (16)			-.06 (2)		.71 (34)	.03 (2)			.06 (5)	.96	.113	
(11)	-.3 (18)	.89 (12)	-.37 (5)	-.58 (8)	.24 (20)	.23 (24)			-.01 (5)		.52 (25)		-.18 (15)		.06 (8)	.98	.107	
(12)	-1.3 (8)	.47 (6)	-.39 (5)	-.11 (1.7)	.35 (34)	.21 (17)					.74 (42)	.04 (3.5)			.05 (5)	.97	.109	
(13)	-2.9 (18)	.84 (12)	-.36 (5)	-.45 (7)	.25 (21)	.22 (24)					.55 (30)		-.18 (15)		.06 (30)	.97	.104	



Table V-4

Dependent variable : LIM

EQ	CONS	LY <sub>t-1</sub> <sup>e</sup>	LY <sub>t-2</sub> <sup>e</sup>	GAP	ΔLCR1	LIF	LIF <sup>T</sup>	LIF-LIF <sup>T</sup>	ΔLIF	LIF <sup>e</sup>	LIF-LIF <sup>e</sup>	LIM <sub>t-1</sub>	LIR <sup>e</sup>	LITR <sup>e</sup>	INF	R <sup>2</sup>	SE
(14)	-1.2 (8)	.40 (6)	-.32 (4)	-0.01 (4.37)	.37 (34)				.20 (26)	.29 (12)	.79 (41)				.02 (2.5)	97	.108
(15)	-2.8 (16)	.77 (10)	-.28 (4.2)	-.40 (5.9)	.25 (19)				.18 (26)	.19 (8)	.57 (25)		-.18 (15)		.06 (5)	97	.106
(16)	-3.1 (20)	.79 (12)	-.21 (3)	-.50 (8)	.20 (17)		.17 (24)	.30 (23)			.54 (30)		-.24 (20)		.06 (7)	97	.103
(17)	-2.7 (16)	.77 (10)	-.28 (4)	-.40 (5)	.25 (10)	.18 (26)			.05 (.6)		.57 (25)		-.18 (15)		.05 (5.7)	97	.106
(18)	-2.7 (18)	.77 (11)	-.28 (4)	-.40 (6.5)	.24 (22)	.18 (27)					.57 (32)		-.19 (17)		.05	97	.102

Table V-5

Dependent variable: LIM<sup>e</sup>

EQ	CONS	LY <sub>t-1</sub>	LY <sub>t-2</sub>	GAP	ΔLCR <sub>t</sub>	LIT <sub>t-1</sub>	LIT <sub>t</sub>	ΔLIT <sub>t</sub>	LIT <sub>t</sub>	LIT <sub>t</sub>	LIT <sub>t-1</sub>	LIR <sub>t</sub>	LIR <sub>t-1</sub>	LITR <sub>t</sub>	LIRM <sub>t</sub>	INF R <sup>-2</sup>	SE
(19)	-1.9 (10)	.76 (11)	-.37 (5)	-.47 (7)	.27 (20)		.18 (26)		.24 (14)	.66 (27)	-.20 (17)				.03 (3)	.97	.106
(20)	-1.13 (6)	.56 (7)	-.39 (5)	-.13 (2)	.33 (27)	.15 (19)		-.01 (5)		.72 (32)					.06 (6)	.97	.110
(21)	-.9 (5)	.52 (6)	-.39 (5)	-.18 (3)	.33 (26)	.14 (15)		.09 (4)		.73 (31)	.03 (2)				.06 (7)	.96	.113
(22)	-1.7 (6)	.63 (8)	-.40 (5)	-.22 (3)	.32 (25)	.16 (19)		-.06 (5)		.72 (31)		.026 (3)			.07 (6)	.97	.113
(23)	-2.7 (16)	.9 (12)	-.31 (5)	-.6 (9)	.2 (16)	.15 (21)		-.01 (6)		.51 (22)	-.20 (18)				.08 (22)	.97	.105
(24)	-.4 (3)	.17 (3)	.18 (3)	-.82 (12)	.29 (29)		.12 (17)	.37 (34)		.93 (59)					.07 (2)	.96	.113
(25)	-.6 (4)	.42 (6)	-.37 (5)	-.14 (2)	.36 (34)	.15 (16)				.8 (47)	.03 (2)				.05 (5)	.97	.110
(26)	-2.3 (15)	.78 (11)	-.29 (5)	-.53 (8)	.24 (21)	.17 (26)				.58 (7)					.06 (33)	.97	.103

Table v-6

Dependent variable : LIM

EQ CONS LY<sup>e</sup><sub>t-1</sub> LY<sup>e</sup><sub>t-2</sub> GAP ΔLCR1 LIE<sup>e</sup><sub>t-1</sub> LIE<sup>e</sup><sub>t-2</sub> LIE<sup>e</sup><sub>t-3</sub> ΔLIE<sup>e</sup><sub>t-1</sub> LIE<sup>e</sup><sub>t-1</sub> LIM<sup>e</sup><sub>t-1</sub> LIA<sup>e</sup><sub>t-1</sub> LIA<sup>e</sup><sub>t-2</sub> INF R<sup>2</sup> SE

(27)	-0.8	.18	-.05	.03	.33				.25	.11	.65		.14	.97	.105
	(6)	(3)	(2)	(1.5)	(34)				(29)	(13)	(39)		(1.6)		
(28)	-2.2	.72	-.22	-.45	.24		.14	.25			.57	-.20	.02	.96	.104
	(13)	(10)	(3)	(6)	(20)		(16)	(17)			(30)	(16)	(2)		
(29)	-1.9	.69	-.27	-.34	.28	.16			.05		.61	-.16	.02	.97	.107
	(11)	(9)	(4)	(5)	(21)	(20)			(5)		(29)	(13)	(2)		
(30)	-2.2	.71	-.23	-.42	.25	.17					.56	-.18	.02	.97	.104
	(13)	(10)	(3)	(6)	(22)	(24)					(30)	(16)	(3)		

Table v-7

EQ	CONS	LY <sup>e</sup> <sub>t-1</sub>	LY <sup>e</sup> <sub>t-2</sub>	GAP	ΔLCR1	LIO	ΔLIO	LIO <sup>e</sup>	LIO-LIO <sup>e</sup>	LIM <sup>e</sup> <sub>t-1</sub>	LIA <sup>e</sup> <sub>t-1</sub>	LIA <sup>e</sup> <sub>t-2</sub>	LIBM <sup>e</sup>	INF	R <sup>2</sup>	SE
(31)	-2.5	.73	-.46	-.38	.33			.21	-.031	.68			-.03	.08	.97	.114
	(9)	(9)	(6)	(5)	(31)			(14)	(3)	(35)			(39)	(9)		
(32)	-7.1	.98	-.37	-.72	.22			.15	-.05	.49		-.20		.01	.97	.107
	(20)	(14)	(5)	(11)	(18)			(11)	(6)	(12)		(17)		(12)		
(33)	-1.8	.66	-.45	-.28	.34	.21	-.02			.67				.07	.97	.110
	(12)	(9)	(6)	(4)	(32)	(14)	(23)			(35)				(10)		
(34)	-2.5	.73	-.46	-.38	.33	.21	-.09			.68			-.03	.09	.96	.114
	(9)	(9)	(6)	(5)	(31)	(14)	(20)			(36)			(3)	(9)		
(35)	-3.3	.98	-.37	-.72	.22	.15	-.08			.49		-.27		.09	.98	.107
	(20)	(14)	(5)	(11)	(18)	(11)	(23)			(25)		(17)		(9)		
(36)	-3.1	1.4	-.75	-1	.20	-.07				.59		-.23		.01	.96	.116
	(21)	(15)	(8)	(9)	(19)	(12)				(21)		(14)		(9)		



Table v-8

Dependent variable : LIA															
EQ	CONS	LY <sup>e</sup> <sub>t-1</sub>	LY <sup>e</sup> <sub>t-2</sub>	GAP	ΔLCR2	LIF	LIF <sup>T</sup>	LIF-LIF <sup>T</sup>	ΔLIF	LIF <sup>e</sup>	LIF-LIF <sup>e</sup>	LIA <sub>t-1</sub>	INF	R <sup>2</sup>	SE
(37)	.77 (6)	.43 (3)	-.19 (1.6)	-1.1 (10)	.05 (10)				.22 (11)	.30 (8)	.27 (9)	.015 (8)		81	.144
(38)	1.5 (14)	.57 (5)	-.47 (4)	-1.1 (12)	.11 (18)		.23 (13)	-.18 (5)			.38 (13)	.01 (9)		83	.135
(39)	.77 (6)	.43 (3)	-.19 (1.7)	-1.1 (10)	.05 (10)	.22 (11)			.08 (2)		.27 (8)	.01 (8)		81	.144
(40)	.74 (7)	.78 (7)	-.51 (5)	-1.3 (12)		.21 (10)					.23 (12)	.02 (12)		83	.138

Table v-9

EQ	CONS	LY <sup>e</sup> <sub>t-1</sub>	LY <sup>e</sup> <sub>t-2</sub>	GAP	ΔLCR2	LIT	LIT <sup>T</sup>	LIT-LIT <sup>T</sup>	ΔLIT	LIT <sup>e</sup>	LIT-LIT <sup>e</sup>	LIA <sub>t-1</sub>	INF	R <sup>2</sup>	SE
(41)	1.1 (9)	.52 (3)	-.28 (2)	-1.3 (11)	.05 (9)					.16 (9)	.15 (6)	.31 (9)	.01 (7)	80 .148	
(42)	.41 (3)	.92 (7)	-.6 (5)	-1.7 (15)	.05 (11)		.09 (5)	.26 (13)				.35 (13)	.01 (7)	82 .140	
(43)	1.6 (9)	.52 (3)	-.29 (2)	-1.3 (11)	.05 (9)	.16 (5)			.05 (.2)			.32 (9)	.01 (8)	80 .148	
(44)	.95 (8)	.86 (7)	-.59 (5)	-1.4 (12)	.05 (9)	.16 (9)						.30 (11)	.01 (10)	82 .141	

**Table y-10**

Dependent variable : LIA <sup>e</sup>														
EQ	CONS	LY <sup>e</sup> <sub>t-1</sub>	LY <sup>e</sup> <sub>t-2</sub>	GAP	ΔLCR2	LIO	LIOT	LI0-LIOT	ΔLI0-LIOT	LI0-LI0 <sup>e</sup>	LI0-LI0 <sup>e</sup> <sub>t-1</sub>	INF	R <sup>2</sup>	SE
(45)	.51 (5)	.58 (5)	-.17 (1.6)	-1.4 (14)	.07 (15)				.05 (2)	-.25 (15)	.20 (8)	.02 (15)	83	.136
(46)	.55 (5)	.60 (5)	-.20 (16)	-1.2 (14)	.08 (15)	.04 (2)			-.3 (15)		.34 (9)	.02 (16)	85	.126
(47)	.19 (1.6)	1.05 (8.8)	-.57 (4.9)	-1.4 (13)	.07 (13)	-.19 (11)					.4 (20)	.02 (11)	82	.139

**Table y-11**

Dependent variable :LIA															
EQ	CONS	LY <sup>e</sup> <sub>t-1</sub>	LY <sup>e</sup> <sub>t-2</sub>	GAP	ΔLCR2	LIG	LIG <sup>T</sup>	LIG-LIG <sup>T</sup>	ΔLIG	LIG <sup>e</sup>	LIG-LIG <sup>e</sup>	LIA <sub>t-1</sub>	INF	R <sup>-2</sup>	SE
(44)	1.45 (10)	.43 (3)	-.30 (2)	-1.43 (12)	.051 (9)					.27 (11)	.08 (3)	.29 (10)	.02 (11)	82	.145
(45)	.99 (8)	.77 (6)	-.61 (5)	-1.13 (9)	.05 (9)		.27 (10)	.12 (5)				.30 (10)	.01 (10)	81	.145
(46)	1.09 (9)	.66 (5)	-.48 (4)	-1.55 (12)	.05 (10)	.23 (10)			-.18 (4)			.31 (10)	.02 (10)	81	.147
(47)	.74 (7)	.84 (7)	-.62 (5)	-1.4 (12)	.05 (10)	.20 (10)						.32 (11)	.02 (10)	82	.142









Table V-15

Dependent variable : LIR

EQ	CONS	LY <sup>e</sup> <sub>t-1</sub>	LY <sup>e</sup> <sub>t-2</sub>	GAP	LIO	LIO <sup>T</sup>	LIO ΔLO	LIO <sup>e</sup>	LIO LIRA <sub>t-1</sub>	LIR <sup>e</sup>	LIRES <sup>e</sup>	LIAP <sup>e</sup>	LIM <sup>e</sup>	INF	R <sup>2</sup>	SE
(74)	-3.1 (11)	3.8 (14)	-2.7 (10)	-2.3 (11)				-.61 (12)	-.31 (10)	.31 (10)				-.03 (11)	70	.191
(75)	-5.5 (24)	3.5 (18)	-1.9 (10)	-1.3 (7)				-.41 (10)	-.48 (19)	.42 (18)	-.70 (19)			-.03 (14)	78	.165
(76)	-4.8 (9)	3.6 (13)	-2.1 (7)	-2.4 (11)				-.57 (11)	-.37 (10)	.20 (9)			-.27 (4)	-.03 (9)	70	.194
(77)	-10 (16)	3.4 (15)	-1.3 (5)	-2.4 (13)				-.37 (8)	-.42 (14)	.18 (7)	-.71 (12)			-.02 (9)	73	.179
(78)	-2.7 (11)	4.1 (16)	-3.2 (14)	-1.8 (8)				-.77 (16)	-.21 (7)	.33 (12)		.48 (10)		-.05 (15)	73	.183
(79)	5.1 (9)	4.3 (6)	-3.35 (14)	-1.3 (7)		3.3 (12)	-.42 (14)		.08 (2)					-.02 (8)	74	.178
(80)	-1.6 (2)	2.9 (14)	-2.7 (14)	-1.3 (9)		1.2 (5)	-.50 (21)		.25 (8)	-.54 (16)				-.02 (13)	78	.161
(81)	3.4 (4)	3.5 (6)	-3.0 (11)	-1.4 (8)		2.9 (9)	-.44 (14)		.05 (2)				-.13 (2)	-.02 (8)	72	.183
(82)	6.2 (11)	.9 (4)	-3.3 (15)	-.8 (4)		3.6 (13)	-.38 (12)		.10 (3)			.15 (5)		-.03 (10)	74	.181
(83)	-3.1 (11)	3.8 (14)	-2.7 (10)	-2.3 (11)			.3 (8)		.31 (10)					-.03 (11)	79	.191

cont.



**Table v-15 cont.**

Dependent variable : LIRA

[illegible]

trend (capacity) level investors are constraint by resource availability. The rate of change in credit proved to be the most satisfactory explanatory variable out of the three concepts of credit used. It exerts a positive effect on the manufacturing sector as well as on the residential building and the rest of the private sector investments and a negative effect on the investment in buildings in the manufacturing sector. On the contrary, its effect on the trade category was statistically insignificant, and as such the variable was dropped from the equation. The effects of the various categories of government investment on the different categories of private investment had different effects depending on the category of the latter. More specifically, the following results were obtained for each category of private investment.

a) Investment in manufacturing. (Tables V-3 to V-7).

According to Table V-3, the expected and unexpected total investment of the public sector have a positive significant effect on the investment in machinery and equipment in manufacturing. The same holds for the trend of the former and the difference between its actual level and its trend.

It should be mentioned that we do not use this trend to represent public investment in infrastructure as the original model suggested, but rather to denote the long gestation periods of investments.

The actual level of current investment has a positive effect, while its rate of change (the actual change proved insignificant in every equation) has a negative

effect indicating a crowding out effect.

The same results were obtained when the public investment in transportation and communication was used, as table V-5, shows. Public investment in infrastructure as a whole and its component investment in energy had a positive statistically significant effect whatever the specification of the investments was (see tables V-4 and V-6). Actual inflation over the expected one has a positive effect, although its coefficient is small in every estimated equation, compared with the estimated coefficients of the other variables.

As far as the rest of the public investment are concerned their expected levels have a positive effect, while their unexpected have a small negative effect. The actual level of them exert a positive influence and their change of level a negative one. Finally expected investments in residential buildings and manufacturing buildings affect positively investment in manufacturing, while investment in trade has a negative effect.

b) Investment in agriculture. (Tables V-8 to V-11).

The change of real credit has a positive effect, although its effect is smaller, according to the estimated coefficient, relative to the corresponding one for the rest of the investments under consideration. It ranges between .05 and 0.11, and between .2 and .37 for the agricultural and manufacturing investment, respectively. Expected and unexpected investment in total public investment, infrastructure, transportation and communication have a positive effect, while the



opposite holds for the unexpected part of the rest of public investment. Their trend levels and the difference between their actual levels from their trends have positive effects, except in the case of infrastructure, where the latter specification has a negative effect. The actual levels of all the categories of public investment have positive influences and the same happens for their rates of change except in the case of total and the rest of public investment. The variable INF affects positively the investment in examination but again as in the previous category of investment its influence is small if we consider the estimated coefficients of the other explanatory variables, except in the case of credit in agriculture. Expected investments in other categories had an insignificant effect and thus they were dropped from the equations.

c) Investment in trade. (Tables V-14, V-15).

This category of investment shows a great deal of differences from the other categories that were examined. First, the estimated coefficients for the product and GAP variable were much higher in every combination of the explanatory variables, as compared with the coefficients of the other investment categories. Their coefficient ranged between .9 and 5.6, for  $LY_{t-1}^e$ , 1.3 and 4.5 for  $LY_{t-2}^e$  and between -.8 and -4.6 for GAP. Second the credit variable had an insignificant effect in every specification and combination of the explanatory variables and for that reason it was dropped from the equations. Third, the actual inflation over its expected value has a negative

effect.

Expected and unexpected total public investment and the rest of public investment that is the total minus infrastructure had a negative effect. The same holds for their trends and the difference between their actual and the trend levels, except in the case of actual trend of the rest public investment. The actual levels of both categories of public investment influence negatively this category of private investment. As it can be seen from the table in certain cases the rate of change of the public sector investment have a positive or negative effect depending on the expected private investment categories that were used as explanatory variables.

Finally, Expected investment in residential buildings, manufacturing and the rest of the private sector have a negative effect, while expected investment in agriculture have a positive effect.

d) The rest of the private sector investments.

(Tables V-12, V-13).

The coefficient of the credit variable has a positive effect, though very small compared with the corresponding one in the manufacturing sector. Expected and unexpected total public investment exert a positive effect and the same holds for the actual level of it, while its rate of change has a negative effect. Their trend and the deviation of their actual level from the trend exert a positive and a negative effect, respectively. The rest of the public investment have a positive effect as far as the expected, trend and actual levels are concerned. On the other hand, their

unexpected part and the deviation of actual from the trend levels exert a negative influence. INF influences positive this category of investment, although its estimated coefficient is small relative to the other coefficients of the explanatory variables. As far as the expected other private investment are concerned, only residential investment proved to exert a negative effect.

e) Investment in buildings in manufacture

$$\begin{aligned}
 \text{LIBM} = & -8.6 + 1.2 \text{LY}_{t-1}^e - .5 \text{LY}_{t-2}^e - 1.9 \text{GAP} - .38 \Delta \text{LCR1} \\
 & (7) \quad (2) \quad (1.6) \quad (5) \quad (6) \\
 & + .03 \text{INF} + .51 \text{LIBM}_{t-1} + .41 \text{LIM}^e \quad (52) \\
 & (5) \quad (5) \quad (11) \\
 \bar{R}^2 = & 95\% \text{ SE} = .262
 \end{aligned}$$

According to the estimated equation, output exerts a strong positive effect on the investments in the investigation, while the cyclical factor exerts a negative effect. The rate of change in credit to manufacturing has a negative effect, indicating that the loans from the banking system provide finance for the machinery and equipment of this sector. INF has a positive effect, small in magnitude relative to the coefficients of the other explanatory variables. The positive coefficient of the  $\text{LIM}^e$  indicates the complementarity between investment in equipment and machinery and in buildings in the manufacturing sector. This complementarity is also reinforced by the positive sign of INF.

f) Investment in residential buildings



$$\text{LIR} = -2.8 + .87\text{LY}_{t-1}^e - .3\text{LY}_t^e - 2 + .5\text{GAP} + .37\text{L}\Delta\text{CR4}$$

(14)    (7)                      (2.5)            (4)            (11)

$$+ .11\text{LRTIN} + .01\text{LIRR}^e + .57\text{LIR}_{t-1} \quad (53)$$

(26)            (9)            (23)

$$\bar{R}^2 = .92 \quad \text{SE} = 135$$

where

RTIN = the rate of return in residential buildings  
defined as

$$\text{RTIN} = \frac{3(Y - Y_{t-1})}{\text{IR} + \text{IR}_{t-1} + \text{IR}_{t-2}} + \Delta\text{LPR}$$

PR = the deflator of IR.

IRR = Weighted real interest rate on private deposits  
that is  $d - \pi^e$  where

d = weighted interest rate on demand, savings, time  
deposits.

The estimated equation shows that, all the variables have a positive influence on this category of investment. This is the only investment category that depends positively on the deviation of current output from its trend level, indicating that excess demand gives a boost to residential investment which is not restrained by the resource availability. This effect is not contradictory to the previous results obtained from the other categories of investment if we consider the following. Investment in residential buildings is an item of the household's portfolio along with money holdings. Excess demand conditions can be perceived as future increases in prices. Given the underdeveloped capital markets, this fact may induce them to invest more in buildings, because of the higher return they

provide relative to money holdings. This is justified also by the positive effect of the real rate of return in residential investment LRTIN. However, the real rate of return of holding money has a positive effect indicating a complementary relationship between the investment in question and money holdings. This relationship can be explained by the fact that the financing of this investment comes either through loans from the banks or money savings (deposits) of the household sector. Furthermore, given the fact that ceilings have been imposed, occasionally on this kind of credit, and the fact that ceilings discriminate against categories of households, money savings are an important source of finance of investment in residential buildings. Thus increased money holdings can finance more residential investments.

#### Ea) The complete model

To complete our analysis on investment behaviour in Greece and to relate it to the inflationary pressures and their relationship with the government deficits we estimated the following equation for inflation, money supply and output.

##### a) The inflation rate.

The price level can be presented as a geometric index of home prices ( $p^h$ ) and foreign (import) prices ( $p^f$ ) :

$$Lp = kLp^h + (1-k)Lp^f \quad (54) \quad \text{or} \quad Lp^h - Lp^f = \frac{1}{k} (Lp - Lp^f) \quad (54)$$

Home prices are affected by excess supply of money, which its final effect on them depends on its influence

to increase real output. This influence on the price level comes through the GAP variable that is the difference between the previous year's real output and its trend level. The relative price between home and foreign (imported) goods exert a negative effect, indicating that if home prices are high relative to imported goods demand will be diverted towards the cheaper imported goods, thus reducing the next year's home inflation.

According to the above home price inflation can be expressed as

$$\Delta Lp^h = c_0 + c_1 (LMR_{t-1} - LMR^d) + c_2 GAP + c_3 (Lp^h - Lp^f)_{t-1}. \quad (55)$$

MR,  $MR^d$ , are real money supply and demand, respectively.

Combining eq 53, 54, 55, we obtain the price inflation equation

$$\Delta Lp = kc_0 + kc_1 (LMR_{t-1} - LMR^d) + kc_2 GAP + c_3 (Lp - Lp^f)_{t-1} + (1-k)\Delta Lp^f \quad (56)$$

b) The money demand.

The money demand equation is given by

$$LMR^d = a_0 + a_1 LY_t^e + a_2 IRR_t^e \quad (57); \quad a_1, a_2 > 0.$$

This specification is consistent with the McKinnon's demand for money function. It emphasises the fact that in repressed economies, the opportunity cost of holding money is the expected inflation rate, while the rate of return on holding money is the real expected interest rate. Note that  $IRR_t^e$  is not in logarithmic form since in some years it has a negative value. From eq (56) (57) we obtain

$$\Delta Lp = kc_0 + kc_1 (LM_{t-1} - a_0 - a_1 LY_t^e - a_2 IRR_t^e - Lp_{t-1}) + kc_2 GAP$$



$$+c3(Lp-Lp^f)_{t-1} + (1-k)\Delta Lp^f \quad (58)$$

Using the LSQ method we obtained the following estimated equation

$$\begin{aligned} \Delta Lp = & .2 + .014(LM_{t-1} - 1.7LY_t^e - (.02 + .1D1)IRR_t^e - Lp_{t-1})_{t-1} \\ & (6.7) (8) \quad (40) \quad (3.6) (9) \\ & + .08GAP - .026(Lp-Lp^f)_{t-1} + .58\Delta Lp^f \\ & (9) \quad (5) \quad (7) \end{aligned}$$

(59)

$$\bar{R}^2 = .93 \quad SE = .0301$$

where, D1 is a dummy variable introduced to capture the change in the inflationary expectations after the second oil crisis. It takes the value of one between the years 1979-81 and zero elsewhere. The positive sign of its coefficient indicates an increase in inflationary expectations which began in 1979 and continued up to 1981. The estimated equation fits the data very well and all the estimated coefficients have the expected signs. The results indicate that it is the previous year's excess supply of money that exerts a positive effect on the price inflation. Moreover, the coefficient of income is greater than one which is a common fact in financial repressed economies.

### c) Money supply

The nominal money supply equation can be defined as a positive function of the government deficit the change in the private credit and the previous periods money supply. This specification of money supply comes from the identity of money stock which postulates that the change in money supply equals the change in credit to the public sector plus the change in the domestic

credit to the private sector plus the change in international reserves. Given the fact that change in public credit is equal to public deficit we have

$$LM3 = m_0 + m_1L(EG+IGTN-RG) + m_2L(DCRN_t-DCRN_{t-1}) + m_3LM3_{t-1} \quad (60)$$

where

EG = Central government expenditures other than investment.

IGTN = nominal public investment.

RG = government revenues.

DCRN<sub>t</sub> = Nominal credit to the private sector.

It should be mentioned that the variable IGTN comprises investment that are taken over, also, by public corporations and are not reflected in the government budget as happens for EG and RG. However, it is true that EG includes expenditures given to public corporations to finance their expenditures. Thus this specification is entirely correct. Furthermore, during the period of rapid economic development these expenditures are designed and planned to act as complements to each other. Note that this specification of investment is consistent with the item total public investment in the National Accounts which was used for the estimation of the investment equations.

The estimated equation is

$$LM3 = .54 + .86L(EG+IGTN-RG) + .24L(DCRN_t-DCRN_{t-1}) \quad (12) \quad (4) \quad (2)$$

$$+ .02LM3_{t-1} \quad (61)$$

$$(1.5)$$

$$\bar{R}^2 = .87 \quad DW = 2$$

The equation seems to fit the data quite well, if we consider that it is neither a entirely behavioral equation not a identity, since the international reserves are not included and also it is an approximation to the money identity given that we have used the logarithms of the variables.

d) Total credit.

As in the case of M3 we approximate the credit identity by assuming that the change in private credit is a function of the change in credit to manufacturing, agriculture, residential buildings, and to the rest of the economy except to trade. (The change in credit to trade is not an explanatory variable in our investment function, furthermore, when it was included in the credit equation the goodness of fit as well as the statistical significance of the coefficients of the other was reduced.)

To approximate the above identity in logarithmic form and also to make it consistent with the rate of change in credit,  $LCR - LCR_{t-1}$  (since this specification was used in the investment function) we have:

$$L(DCRN_t - DCRN_{t-1}) = g_0 + g_1 LCRN1 - g_2 LCRN1_{t-1} + g_3 LCRN2 - g_4 LCRN2_{t-1} + g_5 LCRN3 - g_6 LCRN3_{t-1} + g_7 LCRN4 - g_8 LCRN4_{t-1} \quad (62)$$

where the letter N denotes the nominal values of the corresponding variables.



The estimated regression is

$$L(\text{DCRN}_t - \text{DCRN}_{t-1}) = -.9 + 1.37\text{LCRN1} - .23\text{LCRN1}_{t-1} \quad (4) \quad (7) \quad (3.4)$$

$$+ 1.37\text{LCRN}_2 - 2\text{LCRN2}_{t-1} + 1.4\text{LCRN}_3 - .027\text{LCRN3}_{t-1} \quad (10) \quad (11) \quad (5.5)$$

$$+.063\text{LCRN4} - 1.53\text{LCRN4}_{(-1)} \quad (6) \quad (11) \quad (63)$$

$$\bar{R}^2 = .97 \quad \text{DW} = 1.7$$

e) Total output.

To represent the relationship between investment expenditures and total output we formulate the following equation.

$$\text{LY} = l_0 + l_1\text{LIG} + l_2\text{LIM} + l_2\text{LIBM} + l_3\text{LR} + l_4\text{LIA} + l_5\text{LITR} + l_6\text{LIRES} + l_7\text{LU} \quad (64)$$

where U represents the rest of the items that consists the GDP. The coefficients of IM and IBM were restricted to be equal. Since these two categories of investment belong to the same investment section of the private sector they may exert an equal positive effect on the output of the economy. Furthermore when this restriction was dropped the fit of the regression to the data was very poor. The equation is simply an approximation in logarithms of the actual GDP identity.

$$\text{LY} = .95 + .073\text{LIG} + .024\text{LIM} + .024\text{LIBM} + .076\text{LR} + .014\text{LIA} \quad (37) \quad (9) \quad (10) \quad (11) \quad (5) \quad (7)$$

$$+ .0012\text{LITR} + .061\text{LIRES} + .74\text{LU} \quad (13) \quad (12) \quad (20) \quad (65)$$

$$\bar{R}^2 = .99 \quad \text{SE} = .102$$

To present the interrelationship between investment inflation, money supply and credit we rewrite the estimated investment along with the price inflation money supply credit and output equations. From the estimated investment equations we chose the ones that include as explanatory variables the trend and the deviation from the trend of total public expenditures. This specification of total public expenditure appears to explain satisfactorily all the investment equations.

$$\begin{aligned}
 LIM = & -2 + .72LY_{t-1}^e - .35LY_{t-2}^e - 1.1GAP + .2\Delta LCR1 + .09LIG^T \\
 & (12) \quad (10) \quad (5) \quad (12) \quad (16) \quad (5) \\
 & + .28(LIG - LIG^T) + .08INF + .12LIR^e - .16LITR^e + .63LIM_{t-1} \quad (66) \\
 & (17) \quad (9) \quad (9) \quad (13) \quad (31)
 \end{aligned}$$

$$R^2 = 96\% \quad SE = .108$$

$$\begin{aligned}
 LIBM = & -8.6 + 1.2LY_{t-1}^e - .5LY_{t-2}^e - 1.9GAP - .38\Delta LCR1 \\
 & + .03INF + .41LIM^e + .51LIBM_{t-1} \quad (67)
 \end{aligned}$$

$$\begin{aligned}
 LIA = & .9 + .77LY_t^e - .61LY_{t-2}^e - 1.13GAP + .05\Delta LCR2 + .27LIG^T \\
 & + .12(LIG - LIG^T) + .01INF + .3LIA_{t-1} \quad (68)
 \end{aligned}$$

$$\begin{aligned}
 LTR = & -4.9 + 5.2LY_{t-1}^e - 3.9LY_{t-2}^e - 3.8GAP - .02LIG^T \\
 & - .01(LIG - LIG^T) - .08INF - .32LIR^e + .63LITR_{t-1} \quad (69)
 \end{aligned}$$

$$\begin{aligned}
 LIR = & -2.8 + .87LY_{t-1}^e - .3LY_{t-2}^e + .5GAP + .37\Delta LCR4 \\
 & + .11LRTIN + .01IRR + .57LIR_{t-1} \quad (70)
 \end{aligned}$$

$$\begin{aligned}
 LIRES = & 1.3 + .32LY_{t-1}^e - .21LY_{t-2}^e - .23GAP + .08\Delta LCR3 \\
 & + .78LIG^T - .07(LIG - LIG^T) + .01INF - .12LIR^e \\
 & + .63LIRES_{t-1} \quad (71)
 \end{aligned}$$

$$\Delta Lp = .2 + .014(LM_{t-1} - 1.7Y_t^e - (.02 + .1D1)IRR_t^e - Lp_{t-1})_{t-1} + .08GAP - .026(Lp - Lp^f)_{t-1} + .58\Delta Lp^f \quad (72)$$

$$LM3 = .54 + .86L(EG + IGTN - RG) + .24L(DCRN_t - DCRN_{t-1}) + .02LM3_{t-1} \quad (73)$$

$$L(DCRN_t - DCRN_{t-1}) = -.9 + 1.37LCRN1 - .23LCRN1_{t-1} + 1.37LCRN_2 - 2LCRN2_{t-1} + 1.4LCRN_3 - .027LCRN3_{t-1} + .063LCRN4 - 1.53LCRN4(-1) \quad (74)$$

$$LY = .95 + .073LIG + .024LIM + .024LIBM + .076LR + .014LIA + .0012LITR + .061LIRES + .74LU \quad (75)$$

The working of the model can be seen if we consider an increase in the public investment, in real and nominal terms, in year  $t$ . This increase raises this year's money supply, private investments as a total, and total output, and reduces next year's ( $t+1$ ) private investment, and hence output, and raises inflation, through GAP. At the same time, in year  $t+1$  the increased inflation raises private investment, through INF, which feeds back to output. The total effect depends on the interdependence of the various categories of private investment and on the magnitude of the coefficients of the variables. In year  $t+2$ , GAP reduces investment and increases inflation. However, inflation is affected by  $M3$ ,  $Y_{t-1}^e$ ,  $IRR_t^e$  and  $Lp_{t-1}$ . At the same time investments respond to year's  $t$  initial increase in output, through  $Y_{t-1}^e$ . Thus in year  $t+2$  investment are affected by GAP,  $Y_{t-1}^e$ , INF,  $X_t^e$ . According to the model the final



crowding out(or in) effects of an increase in public investment come not through their immediate impact on private investment and output, but through their interaction with money supply, inflation, the capacity level of the economy and the interrelationship between the various categories of investment.

Note that the immediate impact of a change in government investment expenditure is positive, because the negative coefficients in the estimated TR and IRES equations which correspond to the public investment expenditure variables are very small compared with the corresponding ones in the other estimated private investment equations.

# F) The Neoclassical model

Table V-16 represents the results of the estimated equations for the neoclassical model.

where

$W$  = Wage index in manufacturing.

$KIT$  = Real public sector capital stock in transportation and communication.

$KIE$  = Real public sector capital stock in energy.

$KIF$  = Real public sector capital stock in infrastructure.

$KIO$  = The rest of public sector's real capital stock, i.e.  $(KG-KIF)$ .

$KM$  = Real capital stock in manufacturing.

$YM$  = Real GDP of manufacturing.

$UR$  = user cost of capital which is equal to  $PM(R+\delta_{\mu})-\Delta LPM$ .

$PM$  = Deflator of investment in manufacturing.

$R$  = Short-term lending rate to manufacturing.

$\delta_m$  = Depreciation rate of capital stock in manufacturing.

$\Delta LPM$  = Rate of change of  $PM$ , where  $L$  stands for the logarithm of the variable.

The expected variables were calculated using ARIMA models.

$$(1-.405B^3 -B +.405B^4)YM_t = U_t$$

(2) (2.6)

$$(1-2B +B^2) (1-.684B)W_t = U_t$$

(4)

$$(1-B)(1-.355B^3)UR_t = U_t$$

(2)

The rate of depreciation was calculated by regressing real depreciation (DPM) on the initial real capital stock in manufacturing

$$DPM = P_0 + \delta_m KM_{t-1}$$

$$DPM = P_0 + .03 KM_{t-1}$$

$$R^2 = 73\% \quad DW = 1.2$$

The results show that the only statistically significant variables are the expected product and the rate of change in credit to manufacturing. The model was modified to include as explanatory variable of the adjustment coefficient the actual inflation over its expected level. Moreover, we use the credit variable instead the financial resources available to this sector, since it is impossible to identify this variable for a particular sector of the economy. Furthermore, if we wanted to extend the model to the whole private sector we would have the problem of the unavailability of the variable W for the private sector.



Table V-16  
The neoclassical model

Dependent variable: IM												$R^2$	
EQ	CON	$YM^c_{t-1}$	$UW^c$	$\Delta LCR1$	KG	KIT	KIE	KIO	INF	KM <sub>t-1</sub>	SE		
(93)	5.0	2.1	-.24	.3	2.3			.7	-.7		.101	88	
	(6)	(12)	(.5)	(12)	(.7)			(10)	(1.6)				
(94)	6	1.5	-.35	.2	2.1			.3	-.6		.195	87	
	(10)	(11)	(.7)	(13)	(1.6)			(10)	(1.5)				
(95)	-3	3	-.5	.3			1.5	.1	-.2		.201	90	
	(11)	(15)	(1.2)	(12)			(1.4)	(13)	(1.7)				
(95)	5.5	1.7	-.24	.2				1.6	.6	-.4	.204	94	
	(7)	(12)	(.34)	(4)				(1.7)	(12)	(1.2)			

### G) Conclusions

In this chapter we dealt with the theoretical and empirical relationships between private and public investment, inflation, money supply and credit in Greece. We used for our empirical investigation a model which did not require for its estimation data for capital stock, its user cost, and wages. Models for investment that require these data are very popular in developed countries where they have been proved very successful in explaining the private investment behaviour. The opposite holds for less industrialized countries and our estimates from a modified version of the neoclassical approach for Greece proved the correctness of using a model which does not include the variables we mentioned earlier.

The different specifications of the different categories of government expenditure that we used in the model, and which can be used to assess the short, medium and long run effects of public investment on private investments, proved to explain successfully the private investment behaviour in Greece.

The results were quite different from those we obtained from the summary measures calculated in chapter III and concerned the potentially crowding out effects of the fiscal budget. We found that there is not a direct crowding out effect of public investment, as the summary measures indicated. Drawing our attention to the effects of the trend level of total public expenditures and the deviation of their actual level from it, we found that a crowding in effect of public investment on the total private investment existed in the period under

examination. In particular, we found that the deviation of the actual level of total public investment from its trend level crowds out investment in trade and the rest of the private sector (total private investment minus private investment in manufacturing, agriculture, trade and residential buildings), while the trend level crowds out investment in trade. Private investments in manufacturing, agriculture depend positively on the trend level and the difference of actual public investment and their trend.

Actual inflation exerts a positive effect on all the private investment categories except on the investment in trade. Expected inflation has a negative effect in the different categories of private investment, while the opposite holds for the investment in trade. These findings mean that while a low inflation rate can promote private investment, as a whole, high inflationary expectations can undermine them. This can be seen more clearly if we consider that expected inflation depends on the inflation rate that prevailed during the previous year. Moreover, we found that excess supply of money affects positively the inflation rate. Thus, we can conclude that although there is not a direct crowding out effect of total public investment on private investment, an indirect crowding out effect could have been exercised through the financing of the deficit or the public investment expenditures, since there is an immediate impact of this deficit on the money supply, which, in turn, affects inflation rate, inflationary expectations and, finally, the private investment behaviour.



The fact that a positive relationship between the rate of change in credit and the different categories of private investments (except for those in trade and in buildings in manufacturing) was found, and that the different categories of private investment are related to each other, implies that monetary and fiscal policies can be used in such a way as to promote the growth of private investment characterised by high priority. This argument is further justified if we consider the characteristics of the reserve requirements of the Greek monetary system.

Note that, according to our findings, public investments in infrastructure exert a positive effect on private investment in manufacturing, while their short and/or medium run effects on investment in agriculture are negative. Their effect on the other private investment categories was statistically insignificant. It was because of the latter result that we preferred to concentrate our attention on the total public investment expenditures, and not because we considered our result concerning the impact of the different categories of public investment on the private investment expenditures less useful. Furthermore, our results proved that total public investment expenditures in Greece are extremely important and there are no particular reasons to put any special emphasis on the public investment in infrastructure alone.

## CHAPTER VI

Balance of Payments, Output, Inflation and Government Deficit in Greece.A) Stabilization policies

The emergence of adverse balance of payments and/or inflationary pressures during the 70's in developing and newly industrialised countries, gave rise to the implementation of stabilization programmes.

The causes of the deterioration in the balance of payments have been attributed to both external and internal factors. The exogenous worsening of the terms of trade or the inappropriate domestic policies resulting in an excessive domestic aggregate demand were the main factors contributing to the instabilities in the external accounts of the above mentioned group of countries. The rise in energy prices in 1973-74 and 1979-80, and the weak economic performance of the industrial economies since 1974 exacerbated the adjustment problems of developing and small newly industrialized economies. At the same time inflationary demand management policies, restriction on trade and payments, and rigid exchange rate policies resulted in the loss of competitiveness and consequent balance of payments difficulties.

Examining the causes of the balance of payments problems can help the decision on and evaluation of the appropriate cure for the disequilibrium.

It has been argued that the appropriate cure

depends on whether the origin of disequilibrium is endogenous to the domestic economy. Endogeneity of the causes arises when domestic real factor costs have moved out of line with the level prevailing in international markets as a result of domestic inflationary developments. In this case excessive domestic inflationary pressure is often accompanied by rapid monetary expansion and a rise in aggregate nominal domestic demand. Unwillingness to depreciate the domestic currency at a rate that keeps pace with inflation tends to place upwards pressure on the relative price of non-traded goods and the general price level.

The real exchange rate is rising with a loss of international competitiveness and a deterioration in the current account. If the government attempts to hold down the growth of imports the inflationary pressures will be exacerbated.

Evidence of the extent to which domestic inflation contributed to deteriorating competitiveness during 1973 and onwards can be presented by measuring directly the correlation between the rate of inflation and increases in the real effective exchange rate.

M. S. Khan and D. Knight (1982) examined the correlation between the annual percentage change in the consumer price index and the annual percentage change in real effective exchange rate (calculated using the ratio of the consumer price index in each country examined, to an import-weighted index of foreign prices converted into domestic currency at the relevant bilateral exchange rate) of a group of 48 countries. The



results showed that high inflation countries tended to lose competitiveness more rapidly than those which were able to maintain better control over their domestic inflation rates. An attempt to see whether there is any relation between the rate of change of the real effective exchange rate and the current account (expressed as a percentage in GDP) showed that 27 out of 48 countries had a real exchange appreciation associated with a current account deterioration, 18 countries experienced a worsening of their current account despite a depreciation of their real exchange. Most of these countries experienced large terms of trade deterioration during the period 1973-80.

Khan and Knight (1982) argue that the question of whether stabilization should be implemented or not is relevant to whether the factors responsible for the payments imbalances are likely to be transitory or permanent. If the factors giving rise to a country's balance of payments difficulties are expected to be self reversing they may call for a temporary financing. If there is a permanent alteration in the situation, adjustment of the supply-demand imbalance must take place irrespective of whether it is of internal or external origin. He concludes that two considerations should be taken into account:

- a) The decision to implement a stabilization programme should be based largely on the empirical question on whether a given overall balance of payments position is sustainable in the long-run.
- b) Given the practical difficulty of determining whether

adjustment problems are caused by internal or external factors, it is not always appropriate to tailor stabilization policies specifically to the presumed origin of disequilibrium.

1) The choice of policy instruments for purposes of stabization

Since the need for a stabilization programme comes from excess demand pressures, any stabilization program must involve some elements of demand restraints. However, reliance on demand management policies for short-run adjustments are frequently not well suited to the structural characteristics and problems of small open economies operating under a regime of financial repression. We can classify policies according to whether their initial effect falls on aggregate nominal domestic demand or aggregate real domestic supply. As far as the demand side policies are concerned there is a considerable literature concerning the policies and the dispute on the relative efficacy of monetary and fiscal policies.

Supply-side policies intend to increase the volume of real goods and services supplied by the domestic productive sector at a given level of aggregate nominal domestic demand. There are two broad categories of supply oriented policies :

a) Policies aimed at increasing the total flow of current output by improving the efficacy with which capital labour and other factors of production are allocated among competing uses. This category includes measures to reduce distortions caused by price and

exchange-rate policies, monopolies, taxes, subsidies, and trade restrictions.

b) Policies for enhancing the long-run rate of growth of full capacity output controlling at the same time the expansion of aggregate domestic demand. These aims can be implemented by taking measures to increase savings and fixed capital formation, expansion of education and manpower, training programmes, and stimulation of technological education. It is obvious that policies that can increase the real flow of current output lead to the increase in saving and investment and a more rapid growth of potential output. Given the fact that the current account of balance of payments is equal to the difference between domestic output and domestic absorption, and that the above policies affect the balance of payments through their impact on the current account, an improvement in the balance of payments on current account involves restricting aggregate domestic demand relative to aggregate domestic supply. This emphasizes the importance of making a distinction between supply-side and demand-side policies. The importance of this distinction can be better understood if we consider the following arguments:

a) Expansion of aggregate domestic supply means heavy imports of both working capital and fixed goods. This means that the current account of the balance of payments does not improve, rather deteriorates in the short-run. This implies that the primary objective of a stabilization programme is not always to secure an immediate improvement on the balance of payments or the



current account.

b) Demand-side policies have a macroeconomic character, while supply-side policies often have a microeconomic flavour and a specific incidence. This comes mainly from the fact that supply-side policies must be geared to the market conditions of specific industries. These considerations mean that : i) supply-side policies must be based on thorough knowledge of the nature of the likely response in each individual industry, ii) the use of supply-side policies or demand-side policies depends on the time horizon over which policies are intended to achieve their objective.

It is true, however, that demand-side policies and supply-side policies are related. If a higher rate of growth is to be achieved over the medium term, an increased ratio of productive investment to total domestic absorption is required. This implies that a shift in the aggregate domestic demand must be induced towards fixed capital formation and away from current consumption.

Two issues which must be emphasized and are relevant to the case of developing countries are :

- a) The degree to which monetary and fiscal policy can be used independently to achieve separate objective and
- b) the adverse real effect of the use of restrictive demand management policies.

The degree of interdependence between monetary and fiscal policies in a developing economy (or to NIC under financially repressed conditions) under a fixed exchange rate (and to a certain extent under pegged exchange

rates or heavily managed float) arises because of the linkage between the fiscal deficit and the rate of domestic credit expansion. This linkage comes from a) the narrowness of domestic financial markets, and b) the limited access by government and private domestic residents to international financial markets. This means that the supply of domestic plus foreign savings tends to be relatively inelastic.

The interdependence between monetary and fiscal policy occurs because changes in the money supply are by definition equal to changes in credit to the government plus changes in credit to the private sector and variations in international reserves. If the authorities have no intention to allow the private sector to be crowded out of the domestic credit market, a fiscal deficit is equivalent with changes in the supply of domestic credit. This fact makes impossible the use of monetary and fiscal policy as different policies, to achieve differing objectives (and helps to explain the widespread recourse to subsidiary controls on the level of the public sector's fiscal deficit).

Figure VI-1 illustrates the underlying mechanisms of the interdependence between monetary and fiscal policies, under a regime of fixed interest rates, using the standard IS-LM curves.

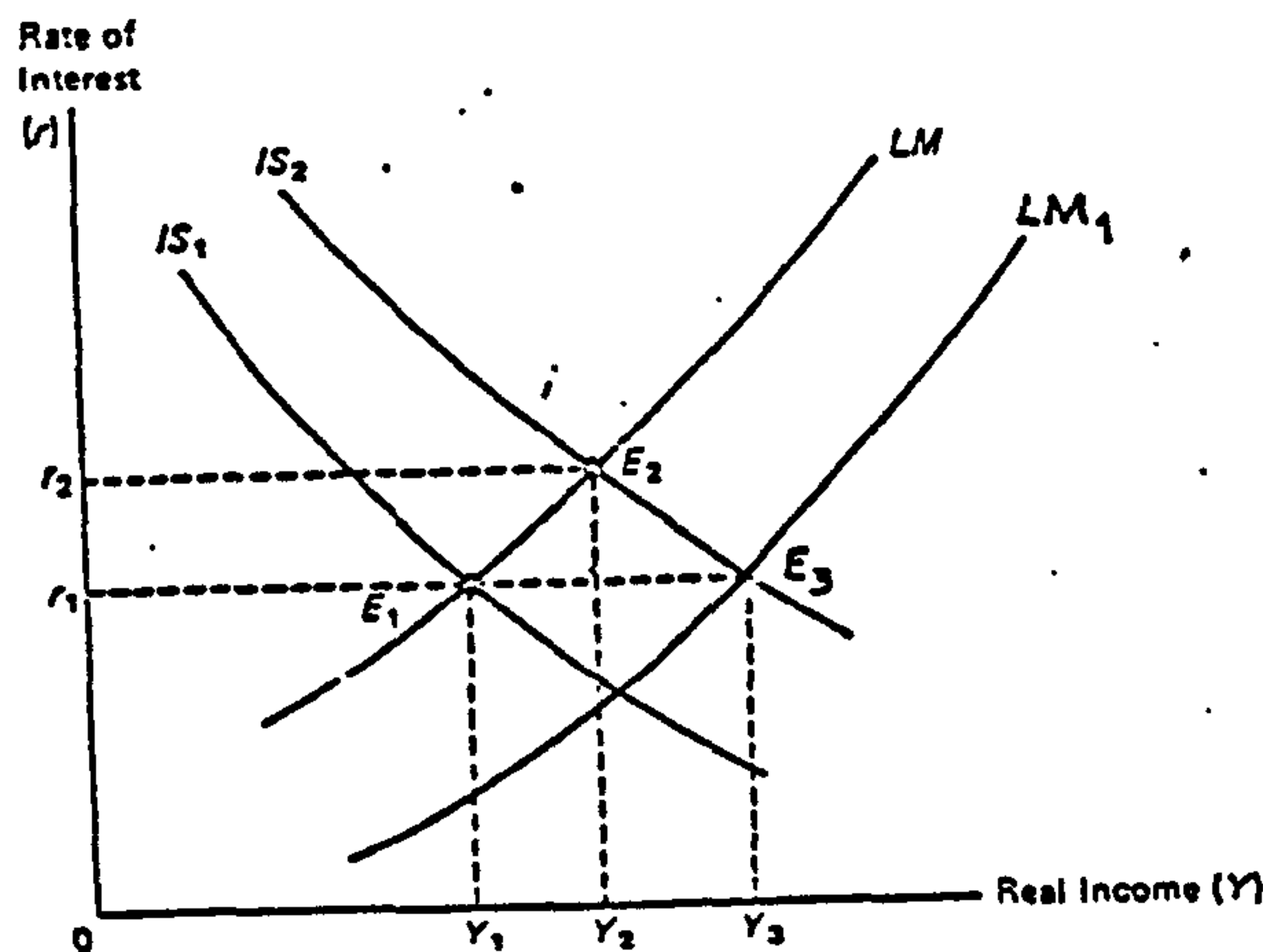


Figure VI-1

The IS-LM Curves

The rate of interest is measured on the vertical axis and the real income on the horizontal one. An increase in government expenditures shifts the IS curve upwards, and the interest rate increases from  $r_1$  to  $r_2$ , to restore equilibrium at  $E_2$ . This is a standard process in well financially organized economies. On the other hand, in a financial repressed economy a shift in the IS curve leaves interest rate at its original  $r_1$  level and at the same time equilibrium is achieved by accommodating monetary policy. Thus the LM curve is shifted towards the new equilibrium  $E_3$ . Any increase in IS is accompanied by an increase in LM, thus making impossible the independent use of monetary and fiscal policies to achieve different goals and even to accommodate the stabilization policies.

The costs of stabilization policies which rely exclusively on demand management are output and employment losses. The monetary approach to the balance of payments suggests that in the long-run in a small open economy a reduction in the level of domestic credit



will be completely offset by international reserve flows which restore the money stock to its initial level, so such a policy has no real effects on the equilibrium level of output relative to its trend. The problem that arises during this adjustment process is (frequently) a reduction in the rate of capacity utilization and a rise in the rate of unemployment.

The degree to which significant output and employment losses were the result of stabilization programmes implemented in countries with balance of payments problems is a matter of controversy.

The size of the deflationary output effect of domestic credit restriction depends on :

- a) The speed with which the initial credit restriction is offset by international reserves flows (an effect which depends on capital mobility and the responsiveness of the current account).
- b) The responsiveness of the domestic inflation rate to the excess demand for real money balances due to credit restraint.
- c) The extent to which the existence of an excess demand for money in the economy will have a deflationary effect on real output.
- d) The direct negative multiplier effect of a fall in real government expenditure on the level of real output.
- e) The speed at which resources can be shifted to the tradable sector.

The conclusion of the above discussion is :

- a) Any examination concerning the stability aspects of the government sector could be unrealistic to define

monetary and fiscal policy as independent instruments to be used for stabilization purposes.

b) Supply-side measures must be excersized to reduce the cost of demand restraint stabilization policies.

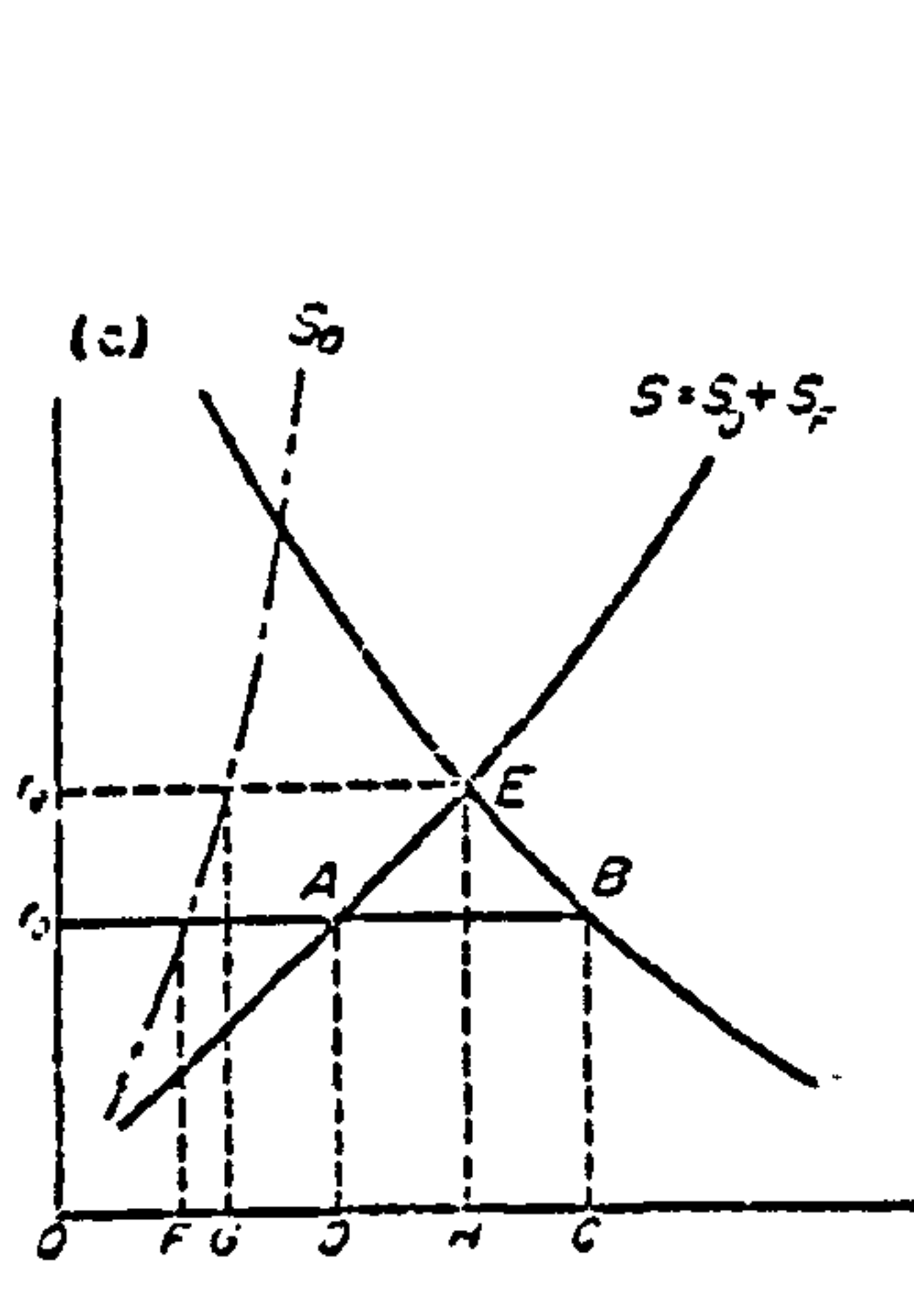
The practical difficulty of the policies aimed at improving the efficiency of resource allocation are :

a) In case that labor and capital are not very mobile among different activities, changes in the pattern of resource allocation may need extended period of adjustment leaving some factors unemployed.

b) Government policies that create distortions are designed to achieve objectives other than economic efficiency.

Distortions are created by monopolies, public sector pricing policies, government price controls, taxes, subsidies, tariffs quotas, and certain industrial regulations.

The problems related to increase potential supply of output can be easily seen with the use of the following figures.



S, I

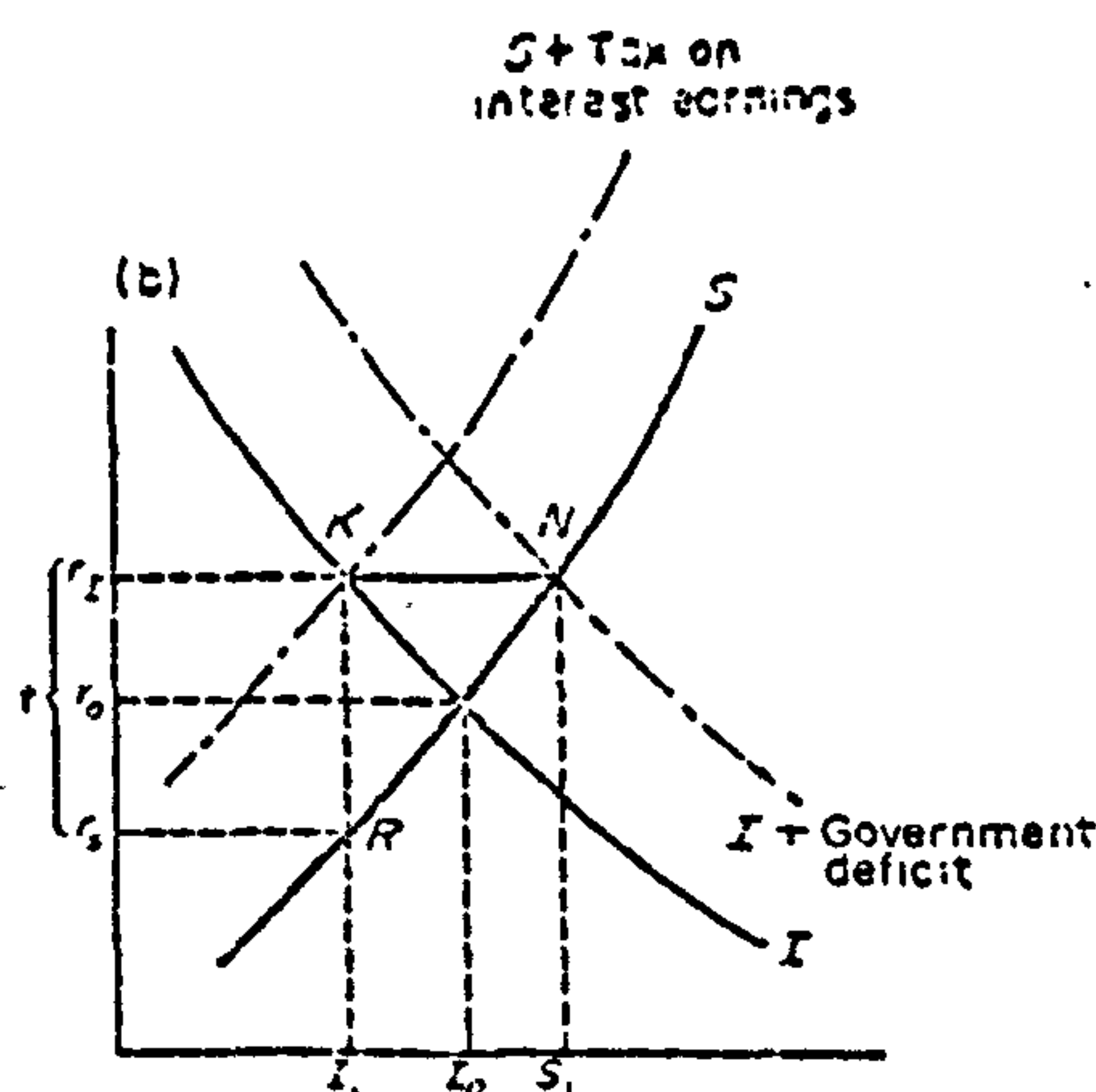


Figure VI-2

Figure VI-3

Financial repressed economies

The figures represent a financial repressed economy.

In figure VI-2 the vertical axis stands for the real return on saving and real cost of investing in fixed capital, while the horizontal axis measures the real private saving and investment.  $S_D$  represents domestic saving, while  $S_D + S_F$  stands for the total supply of funds available to finance domestic investment. Thus  $S_F$  is the capital inflows which comprise foreign savings. The total supply of funds is an upward slopping function of the real return  $r$ . The demand for investment,  $I$ , is negatively related to the cost of capital. At a real return on savings equal to  $r_0$  the supply of savings is equal to  $OD$  and the desired demand for savings by the private sector investors is equal to  $OC$ . Since domestic savings are equal to  $OF$  the current account of the private sector's balance of payments deficit is equal to  $FD$ . Without ceilings the real interest would be  $r_*$ , and given the fact that domestic and/or foreign savings are interest elastic, saving would be higher. At  $r_*$  investment is  $OH$ , while the current account deficit of private sector would rise from  $FD$  to  $GH$ . This deficit however, reflects higher investment financed by foreign capital inflows (doubts have been expressed on the interest elasticity of foreign savings by economists, such as Mackinnon (1973), Mathieson (1979), (1980)).

The effects of the imposition of a tax on interest earnings and an increase in public sector deficit can be represented by Figure VI-3.

A tax of  $t$  on interest earnings will lower the after-tax return per unit of saving to  $r_s$  and raise the



cost of investment to  $r_1$ . Investment will be reduced from  $I_0$  to  $I_1$ . Thus a reduction in the above mentioned tax will increase private saving and investment.

As far as the increase in the public deficit is concerned we have the following situation. Starting from a budget balance situation, private sector savings and investment are  $I_0$  with interest rate  $r_0$ . If public sector runs a deficit equal to  $KN$ , the real interest rate must increase to  $r_1$  to finance the deficit out of private savings. Private savings will increase to  $S_1$  and private investment must fall to  $I_1$ , the difference representing the absorption of real resources by the public sector. This crowding out can be mitigated to the extent that the increase in interest rate will induce an inflow of savings from abroad. Furthermore in the case that the authorities do not intend to increase the interest rate, the financing of the public sector deficit could be accomplished through borrowing from abroad thus creating a balance of payments deficit.

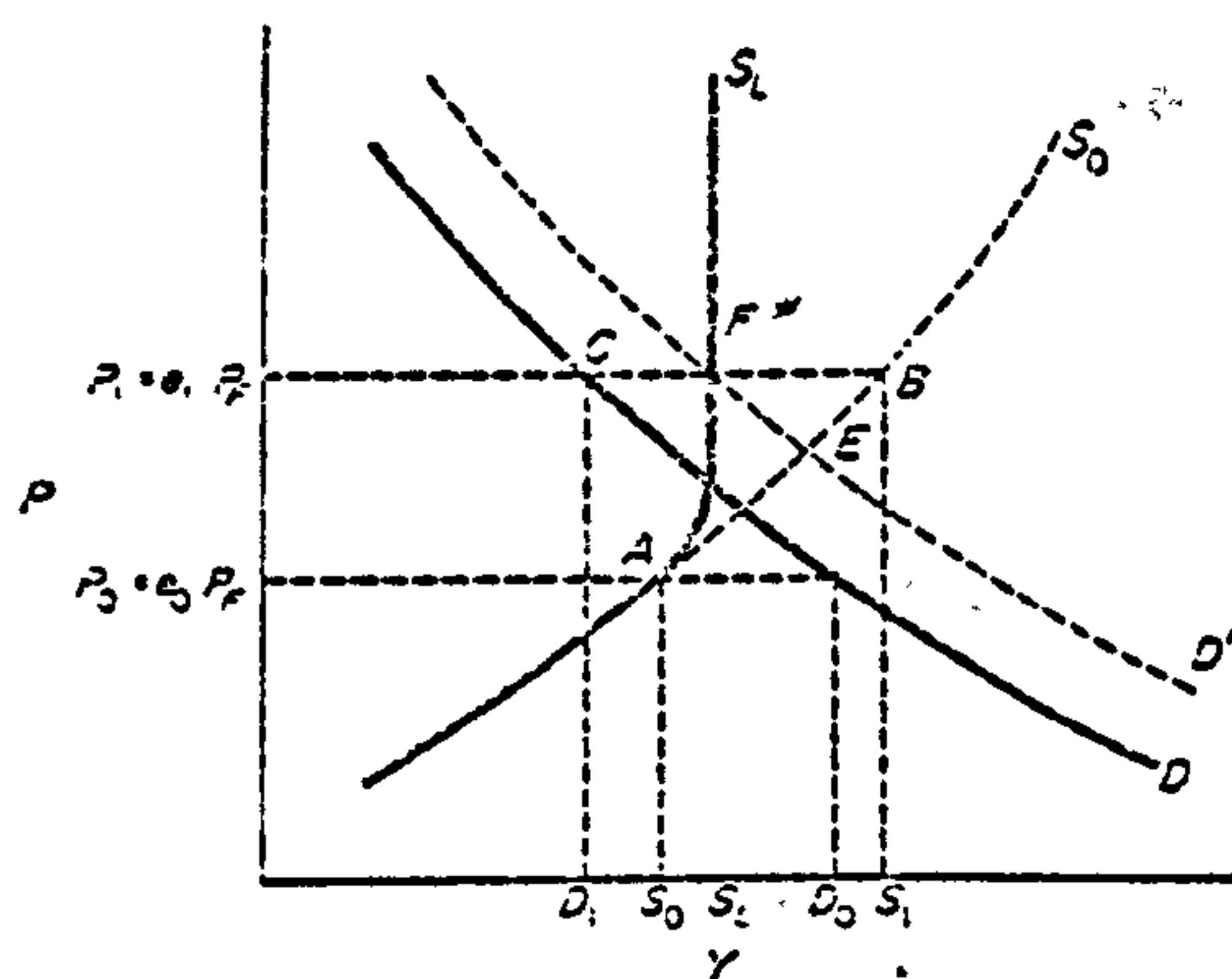
The deficit would be equal to  $I_0 S_1$  in the case that the real interest rate is equal to  $r_0$ . This result can become clearer if we consider that, according to the income accounting identity the deficit in the balance of payment equals the deficit of the private and the public sector (for a detailed analysis of the relationship of the balance of payments and the public sector deficit the reader should draw his attention to the section of this thesis that examines the fiscal approach to the balance of payments).

## 2) Exchange rate changes.

The role of exchange rate policies in stabilization programmes can be summarized in the following considerations :

- a) Imbalances that give rise to the need for stabilization are frequently also the result of the loss of competitiveness.
- b) An exchange rate change initially affects both real domestic absorption and, to the extent that it alters the real exchange rate, the incentive to produce tradable goods. Thus affects the elements of both demand-side and supply-side policies.
- c) The use of devaluation as a tool of stabilization policy has become a controversial issue in recent years owing to the theoretical possibility that it may have deflationary effects on real output and employment particularly in short-run.

Figure VI-4 illustrates the effects of an exchange rate devaluation on aggregate real domestic demand and aggregate supply in a small country which cannot alter its term of trade.



Effects of a devaluation.

Figure VI-4

The horizontal axis measures the quantity of real output

demanded and supplied by domestic residents while the vertical axis measures the domestic currency price of output.  $S_L$  is the long-run supply curve. When the price of output is at  $P_0$  the country produces  $S_0$  and the excess domestic demand is equal to  $D_0 - S_0$  and current account deficit equals  $P_0 (D_0 - S_0)$ .

If a devaluation raises the domestic currency price of output from  $P_0$  to  $P_1$ , demand decreases to  $D_1$  and the supply of output rises<sup>1</sup> to  $S_1$  and there is a current account surplus equal to  $P_1 (S_1 - D_1)$ . Over time, since nominal factor prices gradually rise, output will tend to move back toward its equilibrium level on the long-run supply curve,  $S_L$ . At the same time aggregate demand will shift outwards towards the long-run curve  $D'$  reducing the excess supply of domestic goods and current account surplus. Finally equilibrium will be achieved at point  $F^*$  (the rise in real factor incomes together with the increase in financial assets resulting from the payments surplus will cause the shift in aggregate demand).

The arguments against the above illustration can be summarized to the following :

a) Devaluation redistributes income to groups that have relatively low marginal propensity to consume and the consequent reduction in aggregate demand has a depressing effect on domestic supply which more than offsets the increase in the rest of the world's demand

---

<sup>1</sup>The increase in the supply is caused only by the extent to which a devaluation raises product prices relative to factor prices in the short-run stimulating profits in the productive sector.



for the country's exports.

b) Aggregate supply function can be backwards bending in short-run , (i) either because distortions in the domestic credit market induce a credit crunch and investment deaccumulation or ii) because wage earnings are over-indexed in the sense that nominal wages rise more than proportionately to the devaluation.

c) Reduction in imports (due to devaluation) may contribute to a decline in overall production.

B) The Balance of Paymentsa) Introduction.

Having analysed the instruments of stabilization programs we can proceed by examining the causes of balance of payments imbalances and inflation in Greece.

To measure the role of government to stabilize the economy a dynamic model is required which can incorporate the relations between price, balance of payments and output. The need to construct a model comes from the interdependence between the above mentioned variables. However, besides the construction and evaluation of the model a separate examination of the factors that affect the balance of payments and inflation was implemented. This was considered important given the different approaches to the balance of payments and inflation which make difficult to examine each approach within the context of a dynamic model.

Two models were chosen to examine the issues related to the stabilization programs of governments. The first one examines the balance of payments through the changes in international reserves and it is relevant to the monetary approach to the balance of payments. The second model captures the behaviour and the determinants of the current account of the balance of payments.

The same models were used by M. Khan and D. Knight (1981) and L. Lipschitz (1984) to examine the problems of a group of countries operating under financial repressed systems and fixed or pegged exchange rates. Both models proved to describe the economies in a

satisfactory way, using aggregate data. Given that the only available quarterly data for the public sector in Greece are total expenditures and revenues for the central government and the similarities of the Greek system to the group of countries for which the models were used, the same models were employed with minor alterations.

In order to formulate a model which will try to capture the main channels of interdependence between inflation, balance of payments, output and government deficits, the description of the monetary approach to the balance of payments can be useful since it gives useful insights to the relationship of the above economic variables.

b) The monetary approach to the balance of payments.

The monetary approach is concerned with relationships between the domestic component of the money stock (or the monetary base), prices, output, interest rates and the balance of payments. Under fixed exchange or heavily managed rates (which is the case for Greece) an excess supply of money reduces the growth of international reserves held by monetary authorities. Money supply is regarded as an endogenous policy, since balance of payments deficit or surplus affect it directly. The monetary authorities are powerless, except in the short-run, to alter the money supply. The only choice available is the composition of money between reserves and domestic credit.

An excess demand for goods and/or financial assets is reflected in a disequilibrium in the foreign exchange



market and the balance of payments. The resulting excess supply of real money balances leads to changes in domestic prices, interest rates and output which in turn feed back into the markets for goods and financial assets.

The monetary approach to the balance of payments can be consistent with an analysis of the effects of financial deficits on the balance of payments, considering that from the identity of money supply the domestic money stock equals the net foreign assets of the banking system plus bank credit to the government and private sector. Furthermore, under a system of underdeveloped capital markets the growth of domestic credit is closely linked to the government's borrowing requirements and hence to the overall government budget.

For a simple presentation of the monetary approach we adopt the assumptions that underlined it when it was expositied in the early 1970's

- a) The country is small.
- b) It has a fixed exchange rate.
- c) Perfect international mobility of goods and financial assets exists.
- d) Goods are perfect substitutes. This means that there is one single commodity produced by all countries.

All these assumptions are necessary to equal domestic prices and interest rates with their respective world values. Furthermore, disequilibrium in the markets for goods and financial assets or in the money market will be fully reflected in the balance of payments.

The domestic currency price of the good  $P$  and the

foreign currency price  $P^f$  are related by  $P = e P^f$  (1)

Where  $e$  is the exchange rate in units of domestic currency (the case of the small country implies that  $P^f$  is exogenous and independent of  $e$  in equation (1)).

Another strong assumption of the monetary approach is that flexible wages and prices exist. This is necessary for prices to clear the relevant market, and the nominal price level to adjust real demand to meet full employment output. Since, under these assumptions, domestic output ( $Y$ ) is at its full-employment level  $Y_p$  we have :  $Y = Y_p$  (2)

Money demand in the monetary model is given by

$$M^d/P = m(r, Y) \text{ or } M^d = P m(r, Y) \quad (3)$$

where  $r$  is interest rate which is equal to the world interest rate  $r^f$ , thus  $r=r^f$  (4)

All the assumptions have exogenized the determinants of money demand under fixed exchange rates :

$$M^d = e P^f m(r^f, Y_p) \quad (5)$$

Equation (5) shows that demand for money is proportional to the exchange rate, given  $P^f$ ,  $r^f$ ,  $Y_p$ . It should be noted that wealth is not included as a determinant of money demand. Adding a wealth effect invalidates most of the clear propositions that come from the simple version of the monetary model. (However, the omission cannot be considered as a drawback for our analysis, since we are concerned for economies of underdeveloped capital financial markets). The money supply identity is given by  $M^s = R + DC$  (6), where  $M^s$  is the money supply,  $R$  stands for the international reserves and  $DC$  is the domestic credit. Equating money supply and demand gives

the money market equilibrium :

$$DC + R = e P^f m (r^f, Y_p) \quad (7)$$

The money stock is demand determined since all the determinants of the money demand are exogenous. Movements in domestic credit are determined by government deficits and changes in credit to the private sector  $\Delta DC = a (G - T) + (1 - a) \Delta CP$  (8), where  $a$  denotes the fraction of deficit that is monetized ( $G$  and  $T$  stand for nominal government expenditures and taxes, respectively), and  $CP$  is the credit to the private sector. So we have :

$$\Delta R = e P^f m (r^f, Y_p) - a (G - T) - (1-a) \Delta CP \quad (9)$$

Since the first term of the equation is fixed, changes in reserves are negative related to changes in government deficit and changes to credit in the private sector.

We can now proceed to give a description of how the model works when there are changes in policy. Beginning from a full equilibrium position we consider first the case of a monetary expansion generated by a temporary government deficit. Money supply will increase by an increment to the domestic debt component  $\Delta DC$ . Since money demand is fixed an excess supply of real balances is created which leads to a rise in domestic absorption and a current account deficit. It also puts downward pressure on the domestic interest rate and leads to a capital outflow. These effects reduce reserves until  $\Delta R = - \Delta DC$  and equilibrium is restored. An increase in money supply caused by the budget deficit is eliminated by an equal reserve loss.



In the case of devaluation generated by an increase in  $e$ , there is a reduction in real balances  $M/eP^f$  by the same proportion. This reduces absorption and puts upward pressure on the interest rate, resulting to a current account surplus and capital inflow. The surplus in the balance of payments adds to reserves and thus money supply increases until the latter equals the change in  $e$ ,  $\Delta M/M = \Delta e/e$ . Again the original value of real balances is restored and the system is at equilibrium.

From the simple description of the monetary approach we can see that it considers exchange rate policies as a means to manipulate reserves not the current account balance.

The drawbacks of the approach to describe a stabilization policy when the country is in an initial state of disequilibrium are as follows. In a country with an existing budget deficit, an increase in this deficit increases money supply. An increase in domestic spending and inflation follows. The excess of absorption over domestic output results in a current deficit. At the same time the downward pressure on real interest rates may produce a capital outflow. There will be a loss in reserves. However, the existing budget deficit financed by high powered money continues to create an excess supply and a continuous loss in reserves. The loss in reserves can be stopped by reversing the budget deficit to a surplus that would diminish the money supply, reduce prices and would restore the loss in reserves. What, therefore, is needed is the employment

of budget and monetary policies with no change in exchange rate.

A second alternative could be to end the budget deficit halting the growth in domestic debt component of the money supply and to devalue in order to validate the past increase in  $M$ . What is needed is to devalue until the real money balances  $M/eP^f$  equal the existing level of  $M$ . This would end excess absorption and validate the existing  $M$  as an equilibrium value.

A third alternative implies a gradual path to equilibrium. The budget deficit can be reduced to zero gradually. To validate the existing money stock a jump devaluation is needed which must be accompanied by a further gradual evaluation at decreasing rate to keep real balances in equilibrium as the budget deficit was reduced.

Starting from a disequilibrium position the restoration of the lost reserves can be accomplished by the above mentioned three alternatives. The choice of the right alternative depends on the structural characteristics of the economy which are not part of the monetary approach. Consequently this means that some of the strong assumptions of this approach do not hold and any attempt to describe balance of payments difficulties must introduce structural parameters into the monetary model.

The additional limitations of the model are :

- a) There is no distinction between the current and capital accounts of the balance of payments.
- b) Individuals can carry out the desired transactions in

a costless way by increasing absorption or by a net inflow of financial assets. In addition it is not stated if domestic residents rid themselves of excess money balances by increasing expenditures or by purchasing financial assets abroad. Thus there is no distinction between goods and assets.

The drawbacks of the monetary assumptions are exacerbated if we consider a country in the context of limited free trade, and no perfect capital mobility. Furthermore various lags in adjustment may induce domestic prices and interest rates to rise above their respective world levels before complete adjustment takes place. This means that an increase in the domestic money supply may not be leaked out in the balance of payments. However, as Khan argues by regarding the monetary approach in the longer-run the drawbacks can be overcome. The longer-run approach allows for an exogenous treatment of the output to monetary shocks.

### 1. The description of the model

The following model represents the monetary approach modified in such a way to take into account the short-run aspects of stabilization programmes. Furthermore, changes in the exchange rates and relative prices have been introduced to allow for the impact of changes in the world economy on stabilization policies. The model is consistent with both fixed and pegged (or heavily managed) exchange rates. The overall balance of payments ( $\Delta R$ ) is assumed to be a positive function of



the excess demand for nominal money balances and a negative function of the deviation of the domestic price level from its purchasing power parity equilibrium.

$$\Delta \log R - \Delta \log e_t = r_1 (\log M_t^d - \log M_{t-1}) - r_2 [\log P_{t-1} - \log(e_{t-1} p_{t-1}^f - \beta_0)] \quad (1).$$

where :

$e$  = exchange rate in units of domestic currency per unit of foreign currency.

$R$  = domestic currency value of foreign reserves.

All the other variables were defined in the previous section.

The changes in the domestic currency value of foreign exchange reserves which reflect movements of the exchange rates are subtracted from the left-hand side of the equation. This specification is justified if we consider the following considerations : Assuming that  $F$  is the stock of reserves valued in foreign currency then  $R = e F$ , while in terms of proportionate changes we have  $\Delta \log F = \Delta \log R - \Delta \log e$ . Thus, equation (1) explains the behaviour of the change in the foreign currency reserves since these reserves are related to the excess demand for money stock.

The coefficient  $\beta_0$  represents the equilibrium ratio of domestic prices to prices in the world, which depends on such factors as domestic and foreign tastes and levels of productivity. This term reflects important implications for the countries with heavily managed exchange rates. There is a tendency for nominal exchange rates changes to be less than would have been needed to offset the excess of domestic inflation over the

inflation in the rest of the world and in general to lag behind changes in the domestic price level, resulting in the appreciation of real effective exchange rate. (To calculate the effective exchange rate we divide the home country's consumer price index by an import-weighted average of consumer price indices in partner countries multiplied by the nominal exchange rate). If  $\beta_0$  is relatively stable it can be used as a constant instead of a parameter.

The second term of the right-hand side of the equation can be viewed as reflecting current account and capital account factors. On the one hand this reflects the competitiveness of the economy which directly affects the current account, on the other hand, we can assume that a given decline in a country's competitiveness may induce domestic asset holders to export capital because they expect that the probability of a future devaluation of the exchange rate has increased. However, the restrictions that are imposed on current and capital transactions make it difficult to deal with this distinction. Moreover, the equation is also consistent with the economic environment of the countries of low degree of international mobility of goods and assets which makes it impossible for an excess supply of money to be offset fully and instantaneously through balance of payments leakages. The money stock adjusts to the demand of money with a lag emphasizing the short-run characteristics of the model.

The demand for real money balances is specified in the same way as in Chapter V. Thus it depends on the

real income and the opportunity cost of holding these money balances. In well organized money markets this opportunity cost is the yield on alternative financial assets namely the rate of interest. This specification of the opportunity cost does not hold in economies with interest rates fixed by the monetary authorities, and where the range of alternative financial assets is limited and substitution takes place between goods and money. Thus we have :

$$\log(M^d/P) = F(Y^*, \pi^*) = g_0 + g_1 \log Y_t^* - g_2 \pi^* \quad (2)$$

where :  $Y^*$  = expected domestic real income.

$\pi^*$  = the expected rate of inflation.

$$g_1, g_2 > 0.$$

Substituting for the nominal demand for money into equation (1) we obtain :

$$\Delta \log R_t = r_1 (g_0 + g_1 \log Y_t^* - g_2 \pi^* - \log M_{t-1} + \log P) - r_2 (\log P_{t-1} - \log e_{t-1} - \log P_{t-1}^f - \beta_0) + \Delta \log e_t \quad (3)$$

An alternative for the expected inflation as the opportunity cost of holding money would be the real interest rate (which would be expected to have a positive effect on the demand for money). However, since the data we use are quarterly, and changes in the fixed interest rate do not occur often, the use of the expected rate of inflation is considered to be the appropriate one.

The domestic rate of inflation relative to the foreign rate can be specified as a positive function of the excess supply of real money balances and a negative function of the deviation of domestic prices from their equilibrium level  $\beta_0$ .



$$\Delta \log P_t / \Delta \log(e_t P_t) =$$

$$p_1 (\log m_{t-1} - \log m_t^d) - p_2 [\log P_{t-1} - \log(e_t P_{t-1}^f) - \beta_0]$$

(4)

where :  $m_t$  = real money balances.

$m_t^d$  = real demand for money.

If there is equilibrium in the money market, domestic prices are equal to their equilibrium level  $\beta_0$ , and there is no excess demand in the goods market. With fixed exchanged rates then,  $P_{t-1} = e_{t-1} P_{t-1}^f = \beta_0$ , domestic inflation will be equal to the rate of world inflation. This equilibrium can be violated if an excess supply of real money balances (which could be caused by a fiscal deficit) creates inflationary pressures, which in the long-run tend to eliminate the disequilibrium (through their effects on the current account and/ or capital outflows which reduce reserves and money supply in the money market). In this case  $\Delta \log P_t / \Delta \log(e_t P_t^f) = 1$ , which is one of the basic assumptions of the monetary approach. The negative sign of the coefficient  $p_2$  means that if inflation is led by domestic prices then domestic demand will shift towards the cheaper imports, thus this relative price effect act as a constraint to inflation. Thus whenever prices are pushed away from their equilibrium, for whatever reasons, they will move (the next period) in the direction that restores the initial equilibrium. In the words of M.S. Khan and M. D. Knight " this second term represents a type of catch-up effect to any erosion that may occur in a country's international competitiveness".

To allow for the interrelationship between

reserves, money supply, and government deficits we can introduce the domestic credit and money supply identities :

$$M_t = R_t + DC_t, \text{ and } \Delta DC_t = G_t - T_t + \Delta CP_t. \quad (5)$$

The variables were defined in the previous section.

These two identities can be approximated by linearising them in the logarithms of the variables.

The coefficients of the identities represent the relative sample means of the relative variables.

A further equation can be introduced in the model to endogenize the output. The rate of growth of output is related to : i) the excess stock of real money balances, ii) deviations of actual output from its full capacity level, iii) relative prices or their changes, iv) public policy.

The equation for the output growth can be specified in the following way :

$$\begin{aligned} \Delta \log Y_t = & g_3 ( \log m_{t-1} - \log m_t^d ) - g_4 \text{ GAP} \\ & - g_5 ( \log P_{t-1} - \log e_{t-1} - \log P_{t-1}^f - \beta_0 ) \\ & + g_5 ( \log GE_{t-1} - \log GE^T ) \quad (6) \end{aligned}$$

where : Y = real output.

GE = real government expenditure.

GE<sup>T</sup> = trend level of real government expenditure.

$$\text{GAP}_t = \log Y_{t-1} - \log Y^T.$$

The equation postulates that any tightening of monetary policy will result in a fall in real money balances and will lead to a reduction in real output through hoarding effects on the level of real expenditures.

The variable  $GE^I$  can be used as the expected level of government expenditure and thus, the term  $\log GE_{t-1} - \log GE^I$  reflects the unanticipated increase in real government expenditure. The term is expected to have a positive effect on output.

The negative sign of the coefficient of relative prices term, represents the shift in the domestic demand toward imported goods as a result of the increased domestic inflation relative to the world one.

Whenever the actual level of real income is below its normal capacity level current output will expand.

In order for the output equation to be complete, we should postulate, explicitly, the relationship between government spending in investment and the growth of capacity output. However, quarterly data on government investment expenditure do not exist.

### The complete model

#### Definitions of the variables

##### Endogenous

$\Delta \log P$  = rate of inflation ( $= \pi$ ).

$\Delta \log R$  = growth of international reserves.

$Y$  = real GDP.

$\pi^*$  = expected rate of inflation.

$M$  = nominal stock of money.

$m$  = real money balances.

$GE$  = real government expenditures ( $= G/P$ ).

##### Exogenous



$G$  = nominal government expenditures.

$T$  = nominal government revenues.

$e$  = exchange rate, unit of domestic currency per unit of foreign currency.

$P_f$  = foreign price index.

$Y^T$  = trend level of real GDP.

$\Delta CP$  = change in net claims of the banking system on the domestic private sector.

$GE^T$  = trend level of real government expenditure.

The interrelationships between the endogenous variables of the model can be described in the following way.

Considering that we face a financial repressed economy an expansion of the fiscal deficit will increase the nominal supply of money (assuming the credit to the private sector has not been reduced). This expansion simultaneously raises the next period's rate of inflation and real income and worsens the balance of payments. This increase in prices and the reduction in reserves will lower the real stock of money in the current period. At the same time the expansion of real income will increase the real demand for money in the same period, lowering the excess supply of money and the inflationary effects of the increase in fiscal deficit are, thus, reversed. However, the increase in the expected rate of inflation would tend to lower demand. If the system is stable, long-run inflation will be equal to foreign inflation and the level of real income will be determined by capacity output.

## 2) The results from the estimation of the model

Since the same money demand is introduced in the three equations, a non-linear LSQ method was employed. This technique takes into account the imposition of restrictions on the parameters both within and across equations.

The equations were estimated using quarterly data for Greece for the period 1975-1983.

$$\begin{aligned} \Delta \log R_t = & -1.7 + 1.98 (1.07 \log Y_{t-1} - 1.24 \Delta \log P_{t-2} - \log M_{t-1} + \log P) \\ & (.2) (3.1) (5) (4) \\ & - .4 ( \log P_{t-3} - \log e_{t-3} - \log P_{t-3}^f ) + \Delta \log e_t \quad (7) \\ & (.65) \end{aligned}$$

$$\bar{R}^2 = 55\% \quad SE = .123$$

$$\begin{aligned} \Delta \log P_t = & .2 + .11 ( \log m_{t-1} - 1.07 \log Y_{t-1} + 1.24 \Delta \log P_{t-2} ) \\ & (5.2) (5.7) (5.1) (4) \\ & - .05 \log(P/e P^f)_{t-1} + \Delta \log(e_t P_t^f) \quad (8) \\ & (.5) \end{aligned}$$

$$\bar{R}^2 = 84\% \quad SE = .150$$

$$\begin{aligned} \log Y_t = & .76 ( \log m_{t-2} - 1.07 \log Y_{t-2} + 1.24 \Delta \log P_{t-3} ) \\ & (4.1) (5.1) (4.2) \\ & + .03 ( \log GE - \log GE^I )_{t-4} - .3 \log(P/e P^f)_{t-2} \\ & (7.2) (1.2) \\ & - 1.09 \text{GAP}_t \quad (9) \\ & (3.7) \end{aligned}$$

$$\bar{R}^2 = .65 \quad SE = .109$$

$$\log M_t = 0.75 \log CP_t + .24 \log CG_t + .056 \log R_t \quad (10)$$

(8.1) (5.4) (4.1)

$$R^2 = 98\% \quad SE = .105$$

$$\log CG_t = .14 \log G_t - .038 \log T_t + .91 \log CG_{t-1} \quad (11)$$

(6.1) (4.4) (3.5)

$$\bar{R}^2 = 99\% \quad SE = .123$$

The last two equations (10 and 11) represent

identities specified in a different way from the one described in the original model (see equation 5). The domestic credit, DC, was calculated as the difference between M and R. The credit to the private sector was calculated as the difference between domestic credit and credit to the government, CG. Since the change in credit to the government did not correspond to the government deficit, the coefficients were calculated by running the regressions of the left-hand side, on the right hand side variables of the corresponding identities, which are described by equations (10) and (11). G and T are the nominal expenditures and taxes of the central government, respectively.

The relative price effects are statistically insignificant in all the equations. Note that the different lags that appear in the relative price variables are those that prove to exert the expected effect as far as the signs of the expected coefficients are concerned. Excess money supply is significant as a determinant in all the equations. The coefficient of excess demand in the reserves equation is not statistically different from unity and thus, although has a value of 1.98 it is consistent with the theory, since this coefficient represents an adjustment one which takes values between zero and one. It should be mentioned that the equation for output was not specified as changes in output, since this specification proved to be statistically unsuccessful. Moreover, unexpected government expenditures have a positive significant effect on output, when they are lagged four quarters.



The excess supply of money affects output with a quarter lag. Expected output proved to coincide with the previous quarter's one, while the expected inflation is the rate of inflation that existed two quarters back.

The demand for money is statistically well specified. Its income elasticity is slightly higher than unity, which as has been already mentioned is a common fact in financially repressed economies.

What is more important is the explanatory power of the reserves equations which is much smaller than the other equations. The  $\bar{R}^2$  for this variable is 55%, compared with a 85% and 67% of the inflation and output equation.

The  $\bar{R}^2$ s of the two identities are, as it is expected quite high, given the way they were specified.

The results prove that the model cannot be used to explain the interrelationship between government deficits, output, inflation, and the balance of payments.

C) The current account

The monetary approach to the balance of payments has been criticized for ignoring trade and focusing exclusively on below the line reserve changes. The current account may be more important in countries where an export-led growth policy has been specified or where imports play an important role in GNP.

The previous model describes the interrelationship between price, international reserves, output. This model focuses on the current account of the balance of payments (CA) and its dependence on the money stock disequilibrium, absorption and prices.

The demand for money

Since absorption is directly introduced into the system, we specify the demand for money as a positive function of expected absorption,  $ABS^e$  and a negative function of expected inflation  $\Delta \log P^e = \pi^e$ :

$$M^d = g + g_{11} \log ABS^e - g_{22} \pi^e \quad (1)$$

Inflation

The price level can be specified as a geometric lag index of home price,  $P_h$ , and import prices,  $P_m$ . Taking logs we have :

$$\log P = \epsilon \log P_h + (1 - \epsilon) \log P_m \quad (2)$$

$$\log P_h - \log P_m = 1/\epsilon (\log P - \log P_m) \quad (3)$$

An increase in money supply affects prices according to the capacity for increasing output or imports and thereby raising real absorption. Thus, the expression

$\log Y_{t-1} - \log Y^I$  is introduced into the price equation which is specified as :

$$\Delta \log P_h = p_0 + p_{11} ( \log m_{t-1} - g - g_{11} \log ABS_t^* + g_{22} \pi^* ) + p_{22} ( \log Y_{t-1} - \log Y^I ) + p_{33} ( \log P_h - \log P_m )_{t-1} \quad (4)$$

The specification of this equation differs from the previous model in the introduction of the excess capacity (or demand) term and the dropping of the restriction that there is a one to one relationship between the domestic and the foreign rates of inflation. This can be seen if we combine (2), (3), (4) and obtain

$$\begin{aligned} \Delta \log P_t = & \epsilon p_0 \\ & + \epsilon p_{11} ( \log m_{t-1} - g - g_{11} \log ABS_t^* + g_{22} \pi^* ) \\ & + \epsilon p_{22} ( \log Y_{t-1} - \log Y^I ) \\ & + \epsilon p_{33} ( \log P - \log P_m )_{t-1} \\ & + (1 - \epsilon) \Delta \log P_{mt} \quad (5) \end{aligned}$$

$p_{11}$ ,  $p_{22}$  and  $\epsilon$  are expected to exert a positive effect on inflation. The opposite holds for  $p_{33}$ .

#### Export equation.

Since the country is too small to exert any monopoly power over its exports, then export prices,  $P_x$ , are determined in the world market and export volume depends on the supply responses. These responses depend on domestic prices (or costs), current output and domestic capacity utilization ( $Y - Y^I$ ).

Assuming that exports adjust partially to their expected level we have :

$$\begin{aligned} \log XV_t = & \lambda x_0 + \lambda x_1 ( \log P_x - \log P )_t + \lambda x_2 \log Y_t \\ & + \lambda x_3 ( \log Y - \log Y^I ) + (1 - \lambda) \log XV_t \end{aligned}$$



where  $\lambda$  is the adjustment parameter and  $P_x$  is made up of foreign price and an effective exchange rate. The drawback of this definition is that it does not incorporate the subsidies that are received by exporters from the government. However this information is not available and if it was, it would be a difficult task to incorporate them into  $P_x$ .  $x_1$  and  $x_2$  are expected to have a positive sign, while  $x_3$  is expected to have a negative one.

#### Import equation

The desired volume of imports  $IMP^*$  depends on real absorption, the domestic price level relative to import prices and the excess supply of money.

$$\log IMP^* = \mu_0 + \mu_1 \log ABS + \mu_2 (\log P - \log P_m) + \mu_3 (\log m_{t-1} - g_{11} \log ABS^e + g_{22} \pi^e) \quad (7)$$

All the above variables exert a positive effect on imports. Introducing a partial adjustment mechanism we have :

$$\log IMP = \gamma \mu_0 + \gamma \mu_1 \log ABS + \gamma \mu_2 (\log P - \log P_m) + \gamma \mu_3 (\log m_{t-1} - g_{11} \log ABS^e + g_{22} \pi^e) + (1 - \gamma) IMP_{t-1} \quad (8)$$

#### Absorption.

An equation similar to the equation specified for the output growth for the previous model was introduced.

$$\Delta \log ABS = \sigma_0 + \sigma_1 (\log m_{t-1} - g - g_{11} \log ABS_t^e + g_{22} \pi^e) - \sigma_2 (\log ABS_{t-1} - \log ABS^T)_{t-1} + \sigma_3 \log(G/P) - \sigma_4 \log(T/P) \quad (11)$$

In this equation the relative price effect was dropped since an increase in home prices will shift

demand towards cheaper imported goods and thus absorption will be unaffected. This can be seen if we consider the absorption identity :  $ABS = Y - XV + IMP$ .

The term  $(\log ABS_{t-1} - \log ABS^T)_{t-1}$ , which reflects the deviation of absorption from its trend level lagged one period, influences negatively the growth of absorption. It is lagged one period because it is assumed that in the absence of any current disturbance it is natural for deviations from trend absorption in the last period to be reversed in the current, thus it is consistent with the assumption that real absorption tends towards some steady-state rate determined by real factors. The last two terms, the ratios  $G/P$  and  $T/P$ , capture the effects of the deficit, in real terms on absorption and have a positive effect and negative effect, respectively. The system is closed by two identities :

A real income identity :  $Y = ABS + XV - IMP + TS$  (12),

where, the term  $XV - IMP$  defines the trade balance in goods and  $TS$  the corresponding one in services.

A broad money definition :

$$M_t = CG_t + CP_t + NFA_{t-1} + (XVPX)_t - (IMPPM)_t + K_t \quad (13)$$

where :

$CG$  = government credit.

$CP$  = private sector's credit.

$NFA_{t-1}$  = the last period's net foreign assets of the monetary sector.

$XV_t PX_t -$

$IMP_t PM_t$  = the changes in net foreign assets during the current period.

$K_t$  = represents the net nontrade receipts in the

external account.

In terms of changes the last last identity is given by :

$$M_t = G_t - T_t + \Delta CP_t + XVPX_t - IMPPPM_t + K_t - K_{t-1} + M_{t-1} \quad (13)$$

Taking the log-linear approximations of the identities, we have :

$$\log Y_t = \alpha_1 \log ABS_t + \alpha_2 \log XV_t - \alpha_3 \log IMP_t + \alpha_4 \log TS_t \quad (14)$$

$$\log M_t = \alpha_{11} \log G_t - \alpha_{22} \log T + \alpha_{33} \Delta CP_t + \alpha_{44} \log XVP_t - \alpha_{55} \log IMPPPM_t + \alpha_{66} \log K_t - \alpha_{77} \log K_{t-1} + \alpha_{88} \log M_{t-1} \quad (15)$$

The coefficients of the variables in the identities represent the relative sample means of the corresponding variables.

The estimated model, for Greece, is described by the following equations. The data are quarterly, and cover the same period as the previous model, that is 1975-1983.

The non-linear least square method was used, again for the estimation of the equations.

$$\begin{aligned} \Delta \log P_t = & 2.1 + (.9)(.45)(\log m_{t-1} - 1.02 \log ABS_{t-1} + 3.4 \pi_{t-2}) \\ & (6.1) \quad (3.3) \quad (2.8) \quad (2.7) \quad (2.3) \\ & - (.9)(.014)(\log P - \log P_m)_{t-1} + (.9)(.11)(\log Y_{t-1} - \log Y^T) \\ & (3.3) \quad (.19) \quad (3.3) \quad (.5) \\ & + (1-.9)\Delta \log P_m \quad (16) \\ & (3.4) \end{aligned}$$

R<sup>2</sup>=92% SE=.120

$$\begin{aligned} \log XV_t = & 3.2 + (1.07)(.26)(\log P_x - \log P)_t + (1.07)(.83)\log Y_{t-1} \\ & (1.3) \quad (8.8) \quad (1.68) \quad (8.8) \quad (3.1) \\ & - (1.07)(.25)(\log Y_{t-1} - Y^T)_{t-1} + (1-1.07)XV_{t-1} \quad (17) \\ & (8.8) \quad (1.03) \quad (8.8) \end{aligned}$$

R<sup>2</sup>=87% SE=.140



$$\begin{aligned}
\log \text{IMP}_t = & 11 + (1.06)(.24)(\log P - \log P_m)_{t-1} \\
& (4.8) \quad (5) \quad (.5) \\
& + (1.06)(.28) (\log m_{t-2} - 1.02 \text{ABS}_{t-2} + 3.4 \pi_{t-3}) \\
& (5) \quad (1.28) \quad (2.7) \quad (2.3)^{t-3} \\
& + (1.06)(.02) \log \text{ABS}_{t-1} + (1 - 1.06) \text{IMP}_{t-1} \quad (18) \\
& (5) \quad (3.2) \quad (5)
\end{aligned}$$

$$\bar{R}^2 = .57 \quad \text{SE} = .170$$

$$\begin{aligned}
\Delta \log \text{ABS}_t = & -1 + .13 (\log m_{t-1} - 1.02 \text{ABS}_{t-1} + 3.4 \pi_{t-2}) \\
& (4) \quad (1.6) \quad (2.7) \quad (2.3)^{t-2} \\
& + 1.02 \log(G/P)_{t-1} - .03 \log(T/P)_{t-1} \\
& (4) \quad (1.5) \\
& - .58 (\log \text{ABS}_{t-1} - \log \text{ABS}^T)_{t-1} \quad (19) \\
& (3.8)
\end{aligned}$$

$$\bar{R}^2 = 77\% \quad \text{SE} = .123$$

$$\begin{aligned}
\log Y = & .17 + 1.08 \log \text{ABS}_t + .13 \log X V_t - .27 \log \text{IMP}_t \\
& (3.1) \quad (7.1) \quad (10.2) \quad (6.1) \\
& + .069 \text{TS}_t \quad (20) \\
& (5.2)
\end{aligned}$$

$$\bar{R}^2 = 98\% \quad \text{SE} = .120$$

$$\begin{aligned}
\log M_t = & 1.65 + .033 \log C P_t - .002 \log C P_{t-1} + .047 \log G_t - .01 \log T_t \\
& (1.7) \quad (3.6) \quad (5.1) \quad (3.1) \quad (1.8) \\
& + .01 \log X V P X_t - .036 \text{IMPPM}_t + .8 \log M_{t-1} \quad (21) \\
& (1.6) \quad (1.7) \quad (5.1)
\end{aligned}$$

$$\bar{R}^2 = 92\% \quad \text{SE} = .160$$

To estimate the money supply equation which is used to approximate the money stock change, the domestic credit was estimated residually from the monetary identity as the difference between trade plus no trade receipts and money supply. Then the credit to the private sector in terms of changes was estimated by subtracting the government deficit from the changes in domestic credit.

The explanatory power of the equations is quite good except for the import equation which has the smaller  $R^2$ , compared with the corresponding statistic of the other estimated equations. Expected inflation was approximated by the second lag of the inflation rate since this lag yielded the best results. Expected absorption was specified as the actual absorption lagged one period.

From the estimated equations we can see that relative prices play no role in determining the left-hand side variables. Excess supply of money is the main determinant of the inflation rate. In the imports and absorptions equation excess supply of money is statistically insignificant. The lagged one quarter excess supply of money gave the highest explanatory variable of the import equation. Government expenditures, lagged one quarter, and the excess of absorption over its trend determine the change in absorption. In the exports equation lagged real GNP, its deviation from the trend real GNP lagged one quarter and lagged exports are the statistically significant variables.

The demand for money equation is again well specified. The income elasticity is almost the same as in the previous model, 1.02 and 1.07, respectively. The estimated coefficient is higher than that which was implied from the previous model, that is 3.4 and 1.24, respectively. Note that in this model ABS was used instead of Y.

The historical simulation of the model implied that

the model cannot be used for forecasting purposes.

D) The fiscal approach to the current account

The unsatisfactory results from the above two models, give grounds to approach the analysis of the balance of payments by using a simple version of the fiscal approach. The employment of this approach comes from the quantitative evidence concerning the examination of the macroeconomic performance of developing countries that in the 1970's undertook adjustment programs supported by use of the I.M.F resources under upper credit tranche stand-by arrangements. Donovan (1982), compared the balance of payments, growth, and inflation performance of these countries with that exhibited by all non-oil developing countries during the period of these programs and also examined the accompanying effects of real growth and consumption. The conclusion was that, in general, countries that undertook Fund programmes achieved significant absolute and relative (that is compared with non-oil developing countries) reduction in their external deficits, as well as a relative reduction in average domestic inflation rates. What is more important these stabilization effects were achieved at no cost of lower real rates of growth of gross domestic product and consumption. This was concluded as changes in these variables for program countries on average were found to be not significant different from those experienced by all non-oil developing countries.

Margaret Kelly (1982), after the disclosure of this evidence, investigated the extent to which the above



mentioned reduction in external deficits in program countries resulted from adjustments in the government financial position, as opposed to the adjustments in the rest of the economy. The analysis used was very simple based on national income accounts and monetary survey identities to emphasize the relationship between fiscal and balance of payments variables. Actual data on government savings (investment), total saving (investment) and growth in program countries were examined with the purpose to assess the implications, if any, for growth and medium-term balance of payments objectives of different strategies (that is increases in government savings and reductions in government investment) used in reducing government deficits.

It could be argued that there is no a priori view as to how much balance of payments adjustments (which was the primary objective of Fund programme) can be achieved through adjustments in the government sector. In practice large external imbalances tend to have been associated with large fiscal balance. This means that reduction in external imbalances could be achieved by reduction in fiscal imbalances. Furthermore the size of the fiscal deficit can be controlled more directly by policy instruments than can the private sector surplus or deficit. Programmed reduction in external deficits based on programmed reduction in fiscal deficits often address a major immediate cause of the external disequilibrium and additionally have a greater likelihood of being achieved, provided that policies to reduce fiscal imbalances are actually implemented.

These arguments justify the inclusion in most Fund programmes of fiscal targets and subceilings on credit to the government sector.

Examining actual experience with programs, the validity of the foregoing assumptions can be tested.

The purpose of the study was to examine the relationship of external imbalances and fiscal imbalances directly.

The main findings of the study were :

- i) External imbalances in years prior to the programme years tended to be associated with large fiscal imbalances.
- ii) Reductions and increases (relative to GNP) in the current account/overall balance of payments deficits in the year of fund programmes tended to be associated with reductions and increases (relative to GNP) in the overall government deficit/domestically financial government deficit.
- iii) Large absolute reductions in the deficit of both the government sector and the rest of the economy were achieved in many programmes.

The analysis starts by setting out the basic accounting relationships between fiscal and balance of payments variables.

From the national accounts identity, the current account of the balance of payments is equal to the gap between national savings and investment (or the gap between domestic income and expenditures) that is :

$$Z - X = I - S \quad (1)$$

where I = investment.

$S$  = national savings.

$X$  = exports of goods and nonfactor services and factor incomes from abroad.

$Z$  = imports of goods and nonfactor services and factor incomes.

Decomposing the current account balance into its private and government components we have :

$Z - X = (IP - SP) + (IG - SG)$  (2), where the letters, P and G, refer to private and government sectors, respectively. The first term on the right-hand side of the latter equation represents the private sector resources gap (surplus or deficit), likewise, the second term is the overall government surplus or deficit. (In this definitions foreign grants are specified as a financing item that is below the line. This means that foreign grants are treated as foreign savings in the balance of payments. On the contrary, if they were treated as current transactions in the balance of payments, for consistency, they should be included together with revenues in the overall deficit).

Equation (2) shows that if one wants to consider policies to improve the current account of the balance of payments, the overall government deficit is the appropriate macroeconomic fiscal target on which to focus. Similarly, with respect to the private sector the income surplus or deficit is the relevant macroeconomic target. Equation (2) can be rewritten in such a way to show the relationship between the overall balance of payments and the fiscal variables. Subtracting net inflow of official capital and private capital from both



sides of the equation we obtain :

$$Z - X - KP - KG = (IP - SP - KP) + (IG - SG - KG) \quad (3)$$

where : KP = net capital inflow.

KG = net official capital inflow.

The left-hand side of equation (3) is the overall balance of payments outcome defined as the change in net foreign assets. The equation written in this way stresses the fact that net domestic financing of the government sector is the appropriate macroeconomic fiscal target as far as the external stabilization policies are concerned.

The foregoing equations analyse the relationships between the domestic savings and investment (income and expenditure) gap and the balance of payments. Expressing them in terms of financial variables we have :

$$Z - X = \Delta DC - \Delta M - LPG + KP + \Delta NDCG + KG + LPG \quad (4)$$

$$Z - X - KP - KG = \Delta DC - \Delta M + \Delta NDCG = - DR \quad (5)$$

where : DC = domestic credit.

NDC = net domestic credit.

LPG = borrowing by government from nonbank

domestic sector.

R = net foreign assets.

M = money supply.

Equation (4) shows that financing for the balance of payments current account equals net domestic credit plus foreign capital inflows (including government borrowing and foreign grants). Equation (5) is the familiar monetary survey identity which was used for the monetary approach to the balance of payments.

The equations are simply ex ante conditions for equilibrium and ex post accounting identities. As such, they are useful for comparisons to be made between two points without specifying how the economy moves from one point to the next. For financial programming they can be used to test the internal consistency of programs and in making explicit the overall direction of fiscal policy, which is necessary in countries wanting to undertake balance of payments adjustments. In addition, they enable to quantify the relative contribution of changes in the government deficit and the private sector deficit or surplus to changes in the balance of payments.

Equation (2) indicates that the deficit on the current account of the balance of payments can be changed by policies that change:

- i) the overall deficit or gap between investment and savings of the government.
- ii) the private sector deficit (surplus).

These conclusions do not imply that the two domestic sector financial balances which enter into the current account deficit identities are independent of each other in a policy sense. We should note here that policies that change the private sector balance (that is interest rates, credit policies, exchange rates and tax incentives for investment and savings) can change the fiscal deficit. To these remarks we should add the exogenous factors, that exert their influence on both balances, terms of trade and foreign demand.

The above remarks emphasise that the change in the fiscal deficit cannot be used to quantify the impact of

fiscal policy on balance of payments but what we can measure is the impact of all policies (including fiscal policies), endogenous and exogenous factors that affect the balance of payments via the fiscal balance.

From equation (3) we can see that policies that reduce the domestically financed overall government deficit (for example, policies that increase foreign capital inflows without increasing government expenditures) will exert beneficial effects on the overall balance of payments but not necessarily on the current account. Policies that increase private capital inflows and add to the private sector surplus (or reduce the private sector deficit) will have beneficial effects on the overall balance of payments as well.

Equation (4) shows that a reduction (increase) in the fiscal deficit accompanied by a reduction (increase) in domestic bank and foreign borrowing by the government will lead to a reduction (increase) in the current account of balance of payments.

These conclusions imply that for the fiscal contribution to the current account the government deficit is important, while for the overall balance of payments the domestically financed government deficit is relevant.

It should be emphasized that the treatment of the balance of payments financing loans in equation (3) can lead to misunderstanding. If such borrowing is undertaken by the monetary authorities, it should be added to below- the line part of the balance of payments. If government undertakes all commercial



foreign borrowing this financing should be included as an above the line item with official borrowing. In what follows all loans for balance of payments purposes will be treated as below the line in the balance of payments. To the extent that such loans are used to finance the government deficit, such treatment is equivalent analytically to include these loans with domestic bank financing of the government.

As it has been already mentioned, the choice of policies will depend on a number of factors, such as economic growth, social and distributional objectives of the domestic authorities and the effects of particular policy actions on the achievement of these objectives. Furthermore the administrative, technical and political feasibility of various policy actions the speed with which such measures can be implemented, and the permanency of particular stabilization measures are relevant to the choice of policies. Tanzi (1976) argues that a reduction in the government deficit achieved through a reduction in current expenditure is likely to be less permanent, than a reduction achieved through cut in capital expenditure. Tax increases might also have permanent effects on the budget balance and hence on the balance of payments. However, a reduction in the deficit which permits government capital expenditure to remain unchanged or perhaps increase, while reducing the government current deficit is more growth promoting than current expenditure (and this policy will not be offset by a reduction in savings in the rest of the economy). It could be argued, at this point, that the assumption

regarding the relationship between government savings and total savings is likely to be incorrect in that most policies that affect the government current account (changes in tax rates, subsidies, transfers) also affect private sector savings. A reduction in the government deficit (other things being equal) achieved through a reduction in the unproductive government expenditure is preferable to one on a reduction in productive (growth promoting) expenditure. This distinction between productive and nonproductive expenditure does not necessarily coincide with national accounts distinction between consumption and investment or with what in government budget is classified as current and capital expenditure (or developmental and nondevelopmental expenditure). Another problem, regarding what is productive or unproductive expenditure, arises from the fact that public sector outlays on capital goods may be unproductive owing to the absence of a market test for the government sector. (If we consider that this is intensified under financial repression and it is extended also to the private sector a large divergence between the private and social rate of return may exist). Outlays, however, included in current accounts can enhance the productive capacity of workers and thus act as a complement to physical capital formation in growth process by increasing the productivity of capital stock. The biased that exists in favour of capital rather than current expenditure comes from the fact that it does not affect the overall balance of payments in the short-run, but it should consider that most capital

expenditure entails future commitments for recurrent expenditures. These recurrent costs should be weighted against the benefits of projects financed by concessional loans in determining the appropriate level and composition of government expenditure.

As a conclusion it could be argued that if the aim is to measure the fiscal contribution to changes in the current account of the balance of payments and in the overall balance of payments, the simple national accounts income identity can be used. However, for designing (examining the impact of) fiscal policies for a country's macroeconomic circumstances disaggregated data are required.

In what follows the testing of the above fiscal approach to the current account is presented. To make the examination complete the factors that have been identified as having exerted an important influence on the current account position of non-oil developing countries during the 70's were also included into the model.

These factors are :

- 1) The deterioration in the terms of trade.
- 2) The slow-down in economic activity in industrial countries.
- 3) The sharp increase in the level of real interest rates in international credit markets, particularly toward the end of the decade,
- 4) Inefficient domestic adjustment evidenced by rising fiscal deficit, and
- 5) Appreciation of real effective exchange rates.



These five factors were divided into external and domestic and their effect, as a group, on the current account was examined.

By the word external we mean that they are effectively exogenous to the typical non-oil developing country. The first three variables can be defined as such.

Although some of the above factors, and their influence on the external accounts have been already discussed in the beginning of the chapter, a few considerations should be needed.

The terms of trade of non-oil developing countries taken as a group fell at an average rate of about 2% a year over the period 1973-81. During the preceding ten year period 1963-72 the terms of trade of this group had improved at an average rate of 1/2% a year, so that the decline that began in 1973 represented a distinct change from the historical trend. A considerable part of the terms of trade deterioration in the 1970's can be attributed to the rise in import prices of energy products. However, favourable movements in the prices of primary commodities coincided with oil price increases and helped to mitigate part of the adverse effects.

Furthermore, evidence suggested that between the period of 1962-79 fluctuation in primary commodities prices could be explained to a large extent by cyclical movements in economic activity in industrial countries and by world inflation.

Apart from the indirect effect working via changes in the terms of trade of non-oil developing countries, growth in industrial countries also has a more direct impact on current account, through its influence on the exports of this group of countries. A pronounced decline in the average growth rate of the real gross national product of industrial countries was experienced after the year 1973 compared with the preceding years

( 1963-72 : 4.7%, 1973-81 : 2.8%, 1979-81 : 2%).

Growth in the volume of exports of non-oil developing countries also fell, but the decline was a relatively modest one - from 6.7% in the period 1963-72 to 5.9% in the years 1973-81. At the same time, there was a sharp fall in the average growth rate of imports of industrial countries : from 9% during 1963-72 to 3.6% during 1973-81. It should be mentioned, however, that the slowdown in the growth rate of imports of industrialized countries was not accompanied by a proportionate decline in export growth for non-oil developing as a group. This can be due to two main reasons. Those countries with a relatively higher proportion of manufactures in their exports (which is the case of Greece) were able to capture a larger share of the industrial countries slow-growing import volume. Although this movement was due partly to the granting of tariff preferences in the beginning of the period, it was partially reversed later because of the increased protectionist pressure in the industrial countries market. Non-oil developing countries, diverge a large share of their exports to oil-exporting countries, at the same period, so their

exports were increased relative to their exports to industrial countries. This means that there is a probable leakage in the link between growth of GNP and/or growth in imports of industrial countries and the export volume of developing countries. This, in turn, means that the inclusion of the growth rate of GNP of industrial countries may not be adequate as an explanatory variable in the current account equation. However, 65% of total exports of non-oil exporting developing countries went to industrialized countries in 1978. Thus there must be clear relationship between industrialized countries demand and developing countries supply. Nevertheless, one must not ignore the revenue linkage between developing countries growth and exports of the industrialized countries. It is true that industrialized countries trade primarily with each other, with trade among industrialized countries accounting for 63% of total industrialized countries exports in 1978. But of the remaining industrialized country exports to the rest of the world, non-oil producing developing countries accounted for 40 %, by far the larger fraction. Therefore, trade linkages in both directions can be significant for each group.

A further distinction must be made between cyclical and secular relationships between trade and growth. It is true that market shares do not change rapidly from one year to another, they can certainly, change very significantly over any extended period. This implies that analysis based on cyclical relationships can obscure more fundamental long-term changes that are



taking place. These cyclical factors can exert a great influence in the variables when short-run models are used to interpret the workings of stabilization policy of the authorities. Also their influence can be exaggerated when quarterly data are used (which is our case).

The estimated equations, using quarterly data, for Greece, for the period 1975-1983, gave the following results :

$$1) \text{ CA} = - 719 + .37 \text{ DEF}$$

(2)            (2.7)

$$R^2 = .67, \text{ DW} = 1.9 \quad \text{SE} = .0123$$

$$2) \text{ CA} = - .02T + .4 \log \text{TOT} - .01 ( \log Y_t^f - \log Y_{t-1}^f )$$

(3)            (2)                            (.2)

$$+ .07 \text{RIR} - .4 \text{ RER} + .8 \text{ DEF}_{t-2}$$

(.8)            (1.9)            (2.1)

$$R^2 = .88, \text{ DW} = 1.8 \quad \text{SE} = .0150$$

$$3) \text{ CA} = .7 T + .4 \text{ DEF} - .9 \text{ RER}$$

(2)            (2.8)            (1.3)

$$\bar{R}^2 = .69, \text{ DW} = 1.9 \quad \text{SE} = .0179$$

$$4) \text{ CA} = .9 T + .5 \log \text{TOT} - .2 ( \log Y_t^f - \log Y_{t-1}^f ) + .08 \text{ RIR}$$

(2)            (3)                            (.3)                            (1.2)

$$\bar{R}^2 = .50, \text{ DW} = 1.6 \quad \text{SE} = .125$$

where : CA = the ratio of current account to exports  
in U.S.A dollars.

TOT = the ratio of unit value of exports to the  
unit value of imports.

RIR = the real interest rate, calculated as the  
three-month Eurodollar deposit rate minus  
the changes in the Greek U.S.A dollar

export price index.

RER = the real effective exchange rate  
calculated as the ratio of home consumer  
price index to U.S.A corresponding index  
multiplied by the exchange rate.

DEF = the deficit of the central government  
(revenues minus expenditures) relative to  
GDP.

$Y^f$  = U.S.A's GDP in real terms. (In U.S.A  
dollars).

The equations imply that the deficits with the  
terms of trade are the main determinants of the C.A.  
When the deficit is lagged two periods is statistically  
significant in equation (2). The real interest rate have  
the opposite sign and the same applies to the growth of  
U.S.A output. However in every equation they are  
statistically insignificant.

Equation (1) specifies the current account as a  
function of deficit only, which proved to be  
statistically significant. Equation (2) includes all the  
external and domestic factors, that are expected to have  
an influence on CA. The estimated equation indicates  
that the terms of trade and the deficit lagged two  
periods exert a statistically significant influence.  
Equation (3) includes the domestic influences only on  
the CA. The deficit proved to be the only explanatory  
variable. Finally equation (4) which is determined by  
the external factors only, implies that the TOT exert an  
influence on the CA.

E) An alternative approach to the balance of payments

The following specification of the determinants of the international reserves can be traced to earlier studies (by Kenen Yudin 1965, Clower and Lipsey 1968, Archibald and Richmond 1971) which consider the demand for reserves as an important argument in the demand function. Since it has been argued that the demand function also depends on the propensity to import, changes in the demand for international reserves depend on the propensity to import. The rationale for this specification comes from the Keynesian priceless model of the foreign trade multiplier. According to this model, an external disequilibrium induced by a decline in export earnings could be corrected by a decline in output, proportional to the multiplier. The cost of output adjustment could be saved if the monetary authorities are able to run down their stock of international reserves to finance the external deficit. Since, the foreign trade multiplier is inversely related to the propensity to import the popular approach argues that the cost of not having reserves, the demand of reserves, is inversely related to the marginal propensity to import. The appearance of a positive sign, in many empirical studies, used to estimate the demand for reserves, in front of the coefficient of the marginal propensity to import led to another interpretation of this variable. It has been suggested that this variable is a proxy for the openness of the economy and as such, it measures the extent to which the economy is affected by external disruption.

Under the above considerations the demand for



international reserves can be specified as :

$$\log R_t = \alpha_0 + \alpha_1 \log IM_t + \alpha_2 \log IMP_t + \alpha_3 \log R_{t-1}$$

where : IM = imports.

IMP = marginal propensity to import,

approximated by the ratio of imports to

GNP (the average propensity to import).

The main differences between the monetary approach to the balance of payments and this one (specified in the equation above) can be summarized in the following concepts :

The monetary approach stems from the monetary equilibrium and stresses the fact that under heavily managed exchange rates the monetary authorities cannot affect the nominal money stock. Credit policies are treated as the exogenous variables which, with the demand for money are the determinants of the international reserves. Under this framework, the possibility that the monetary authorities may have preferences over the composition of their assets is ignored. Thus this second approach deals with preferences.

To test empirically this approach we regress the international reserves on imports, the propensity to import, the ratio of domestic prices to foreign, and their changes and the previous period's reserves.

The results are given in the three following equations :

$$\log R_t = -.007 + .19 \log IM_t - .34 \log IMP_{t-1}$$

(2.4)      (2.23)      (3)

$$- 1.17 \log(P/e \cdot P^f)_{t-1} + 1.18 \log(P/e \cdot P^f)_{t-2} + .76 \log R_{t-1}$$

(3)                      (4)                      (5)

$$\bar{R}^2 = .99, \text{ DW} = 2.1 \quad \text{SE} = .128 \quad (1)$$

$$\log R_t = \underset{(2)}{-.006T} + \underset{(2.11)}{.17 \log IM_t} - \underset{(3.4)}{.31 \log IMP_{t-1}}$$

$$(2.25) \quad - .3 [ \log(P/e P^f)_t - \log(P/e P^f)_{t-1} ] + .76 \log R_{t-1} \quad (7.69)$$

$$\bar{R}^2 = .99, \text{ DW} = 2.1 \quad \text{SE} = .123 \quad (2)$$

$$\log R_t = .0028 + .18 \log IM - .16 \log IMP_{t-1}$$

(2)
(2.11)
(3.4)

$$- .44 \log(P/e P^f) + .69 \log R_{t-1} \quad (3)$$

(0.64)                      (4.11)

$$\bar{R}^2 = .99, \text{ DW} = 2 \quad \text{SE} = .130$$

The regressions were estimated with the OLSQ method and are corrected for serial correlation.

where : IM = imports in drachmas.

IMP = marginal propensity to import, defined as  
IM/GNPN (imports in drachmas/GNPN in  
drachmas).

P = consumer price index.

e = exchange rate, units of domestic currency  
per unit of U.S.A dollars.

Regression (1) is estimated using the lag operator for the relative prices to approximate the expected relative prices. So the coefficients in front of the relative prices include the weights of the distributed lag operator. Since the sum of these coefficients is positive, this kind of formulation was rejected.

In regressions (2) and (3) the changes in relative prices and the actual ratio of prices were used respectively. From the two regressions the one with the changes in relative prices explains best the demand for reserves. The marginal propensity to import affects

significantly the demand for reserves when it is lagged one quarter.

Since this approach is justified by the results, we extend the one regression model, in order to take into account the government deficits and its interdependence with imports, inflation rate and output.

The model is described by the following equations :

$$\log R_t = c_0 + c_1 (\log IM_t + c_2 \log IMP_{t-1} + c_3 [\log(P/e P^f)_t - \log(P/e P^f)_{t-1}] + c_4 \log R_{t-1} \quad (4)$$

$$\log Y_t = c_5 + c_6 (\log m_{t-1} - c_7 \log Y^* - c_8 P^*)_{t-1} + c_9 (\log Y^I - \log Y_{t-1}) + c_{10} (\log G_{t-1} - \log G^I) + \log Y_{t-1} \quad (5)$$

$$\Delta \log P = c_{11} (\log m_{t-1} - c_7 \log Y^* + c_8 \pi^*) + c_{12} \log(P/e P^f)_{t-1} + c_{13} [\log(e P^f)_t - \log(e P^f)_{t-1}] + c_{14} (\log Y^I - \log Y_{t-1}) \quad (6)$$

$$\log IM_t = c_{15} T + c_{16} (\log m_{t-1} - c_7 \log Y^* + c_8 \pi^*)_{t-1} + c_{17} Y_{t-1} + c_{18} \log(P/e P^f)_{t-1} + c_{19} \log IM_{t-1} \quad (7)$$

$$\Delta \log M_t = c_{19} + c_{20} \{\log[(R e)/GNPN]_t - \log[(R e)/GNPN]_{t-1}\} + c_{21} \log[(G - T)/GNPN]_t + c_{22} (\log M_{t-1} - \log M_{t-2}) + c_{23} DUM1 + c_{24} DUM2 + c_{27} (\log Y_t - \log Y_{t-1}) \quad (8)$$

Equation (4) is the previous equation of international reserves. Equation (5) describes the changes in real GNP as a function of the previous period's excess supply of real money, the deviation of the previous period's real GNP from its trend value and the deviation of the previous period's real government (GR) expenditures from its trend. Equation (6) is the



already discussed inflation rate determination. Imports in equation (7), in drachmas are defined as a function of the previous period's excess real money supply, previous period's relative prices, real GNP, lagged one period and the previous period's imports. All the variables are expected to have a positive effect on imports. The final equation describes the changes in nominal money stock as a function of, i) changes in reserves (measured in drachmas) as a ratio of GNP, ii) the government deficit as a ratio of GNP, iii) the previous change in money stock, iv) changes in real GNP, v) and two dummy variables DUM1, DUM2, which describe the shift in money stock due to the election period and the change in the political environment after 1982, respectively. DUM1 takes the value of 1 in the third and fourth quarter of 1977 and 1981, respectively. DUM2 takes the value of 1 from the first quarter of 1982 and onwards. All the variables exert a positive effect except the previous change in the money supply which its effect is not known a priori, the same applies to DUM2. Thus in this model money supply is a behavioural equation not a identity as in the previous models. This specification proved to be better than the use of identities, as far as the estimation of the model is concerned. However in this model the emphasis is not on the money supply identity, which was necessary for the assumptions of the monetary approach to the balance of payments. Furthermore we use GNP in every equation to make the model consistent with the reserve equation.

The results from the estimation are given in the

following equations :

$$\begin{aligned} \log R_t = & -.006T + .18 \log IM_t - .37 \log IMP_{t-1} \\ & (2.4) \quad (2.11) \quad (3.4) \\ & - .24 [\log(P/e P^f)_t - \log(P/e P^f)_{t-1}] + .69 \log R_{t-1} \quad (4) \\ & (3.8) \quad (8) \end{aligned}$$

$$\bar{R}^2 = 99\% \quad SE = .128$$

$$\begin{aligned} \log Y_t = & 9 + .26 (\log m_{t-1} - .46 \log Y_{t-1} + 2.4 P_{t-2})_{t-1} \\ & (2.7)(.9) \quad (4.34) \quad (3.15) \\ & - .004 (\log Y_{t-1} - \log Y^I) + .59 (\log GE_{t-1} - \log GE^I)_{t-4} \\ & (1.5) \quad (2.2) \\ & + \log Y_{t-1} \quad (5) \end{aligned}$$

$$\bar{R}^2 = 64 \quad SE = .154$$

$$\begin{aligned} \Delta \log P = & -.07 + .4 (\log m_{t-1} - .46 \log Y_{t-1} + 2.4 \pi_{t-2}) \\ & (1) \quad (2.21) \quad (3.15) \quad (4.3) \\ & - .07 \log(P/e P^f)_{t-1} + .007 [\log(e P^f)_t - \log(e P^f)_{t-1}] \\ & (1.67) \quad (.11) \\ & + .28 (\log Y_{t-1} - \log Y^I) \quad (6) \\ & (8.5) \\ \bar{R}^2 = .92\% \quad SE = .109 \end{aligned}$$

$$\begin{aligned} \log IM_t = & .015 T + .04 (\log m_{t-1} - .46 \log Y_{t-1} + 2.4 P_{t-2})_{t-1} \\ & (1.76) \quad (5.34) \quad (3.15) \quad (4.3) \\ & + .56 \log(P/e P^f)_{t-1} + .17.16 \log IM_{t-1} \quad (7) \\ & (3) \quad (1.52) \end{aligned}$$

$$\bar{R}^2 = 82\% \quad SE = .145$$

$$\begin{aligned} \Delta \log M_t = & .03 + .003 (\log[(R/e)/GNPN]_t - \log[(R/e)/GNPN]_{t-1}) \\ & (5.1) \quad (5.5) \\ & + .21 \log[(G-T)/GNPN]_t + .01 (\log M_{t-1} - \log M_{t-2}) \\ & (4.53) \quad (.16) \\ & + .025 DUM1 - .012 DUM2 + .001 (\log Y_t - \log Y)_{t-1} \quad (8) \\ & (3.67) \quad (2.81) \quad (4.5) \\ \bar{R}^2 = 98\% \quad SE = .104 \end{aligned}$$

The model was estimated with the non-linear least squares method.

As we can see from the t-ratios relative prices play an insignificant role in the determination of the

inflation equation, while exert a significant effect on the imports and reserves equation. Excess supply of money determines inflation rate and imports, although the estimated coefficient for the imports function is very small (.04). In the real GNP equation none of the assumed explanatory variables proved to be statistically significant, except the unexpected real government expenditures, lagged four quarters. The excess of previous quarters' GNP over its trend has a positive significant effect on the inflation rate. Reserves are well specified. From the money supply equation we can see that government deficits and the two dummy variables play the most significant role in determining money supply. (The coefficients of international reserves and the change in real GNP are very small, .003 and .001, respectively). Finally, the demand for money is, again well specified. The estimated income elasticity is less than one, .46 compared with the 1.07 and 1.02 of the corresponding ones of the previous estimated models. The coefficient of expected inflation is also different from the previous estimations (i.e. 2.4 for the current model, 3.4 and 1.24 for the other models). As in the previous models the expected income and inflation were approximated by the past one and two quarters, respectively.

The simulation of the model proved that it cannot be used for prediction purposes.



## F) Conclusions

In this chapter we tried to investigate the relationships between public deficit, output, the inflation rate and the balance of payments, for Greece. Different theoretical approaches and different specifications of the balance of payments were used.

The models we used proved to be unable to explain the short-run behaviour of the above mentioned variables. This fact indicates that more detailed models are needed to explain the interdependence of these variables and at the same time it stresses the need for the availability of disaggregate data for a period long enough to be used for research purposes. However, usefull insights were extracted from these models. First, we found that the excess supply of money is the main determinant of the inflation rate, and this explains the coexistence of high fiscal deficits and inflation rates, given the direct effect of the former on the money supply. Moreover, inflationary expectations play an important role in the actual inflation rate, since they affect negatively the demand for money. Second the actual or unexpected government expenditures in real terms affect positively the real output or absorption.

The alternative model of the balance of payments explaines best the behaviour of the balance of payments. This implies that contrary to the monetary assumptions, the monetary authorities are able to affect or control the nominal stock of money and the amount of the country's international reserves. Thus, the structural

characteristics of the economy which are affected by the institutional arrangements between the fiscal and monetary authorities and not the exogenous to the economy factors are responsible for the imbalances in the country's external accounts. This conclusion is further justified if we consider our findings from the simple version of the fiscal approach to the balance of payments that the fiscal deficit has a direct effect on the current account of the balance of payments.

According to the alternative model we found that the demand for international reserves is negatively affected by the propensity to import and the change of the domestic relative to the foreign prices, while the imports affect it positively. The importance of this result can be clearly seen if we consider that according to the estimated import and inflation equations in the model, excess supply of money affects positively the demand for imports and the inflation rate, while relative prices play a significant role in determining the import equation. This means that the domestic structural characteristics of the economy should be changed to create favourable for the balance of payments terms. This structural changes should concern the fiscal deficit and their financing.

CHAPTER VIIThe Phillips curve and rational expectations for GreeceA) The theoretical model

All the previous models dealt with inflation as a phenomenon arising from the existence of excess supply of money and as such they can be defined as monetary models of inflation. The major alternative to this approach is the model for real activity. According to this Phillips-Lipsey model, wage inflation is negatively related to the rate of unemployment. Given that excess demand for labor is negatively related to the rate of unemployment and that the general level of inflation is positively related to unit labor cost, inflation is explained by excess demand for labor. This relation was characterized as a stable trade off between inflation and unemployment. Later under the development of the natural rate of unemployment hypothesis (Friedman, 1968 and Phelps, 1967) a distinction between the short and the long-run Phillips curve was made. Finally, according to the rational expectation school the systematic trade off between inflation and unemployment was rejected.

Taking as the starting point the modified Phillips curve (Samuelson and Solow, 1960), in which the rate of inflation is determined by the demand pressures in the labor market and the expected inflation we have :

$$\pi_t = f(u_t) + \pi_t^e = \pi^e - b(u_t - u_t^e) \quad (1)$$

The actual rate of inflation is a function of the expected rate of inflation and the deviation of the



actual rate of unemployment  $u_t$  from the natural rate (NR)  $u_t^*$ . The difference  $u_t - u_t^*$  can be approximated by the overall excess demand in the goods and labour market. If unemployment is below its natural level  $u_t - u_t^* < 0$ , overall excess demand exists and the rate of inflation rises relative to the expected rate (the natural rate of unemployment is that unemployment rate which remains constant at each inflation rate, as long as that rate is fully anticipated, or the unemployment rate at steady-state).

Expected inflation is assumed to be generated by adaptive expectations so that :

$$\pi_t^* = \theta \pi_{t-1} + (1-\theta) \pi_{t-1}^* = \pi_{t-1}^* + \theta (\pi_{t-1} - \pi_{t-1}^*) \quad (2)$$

The working of the model can be seen by the following figure.

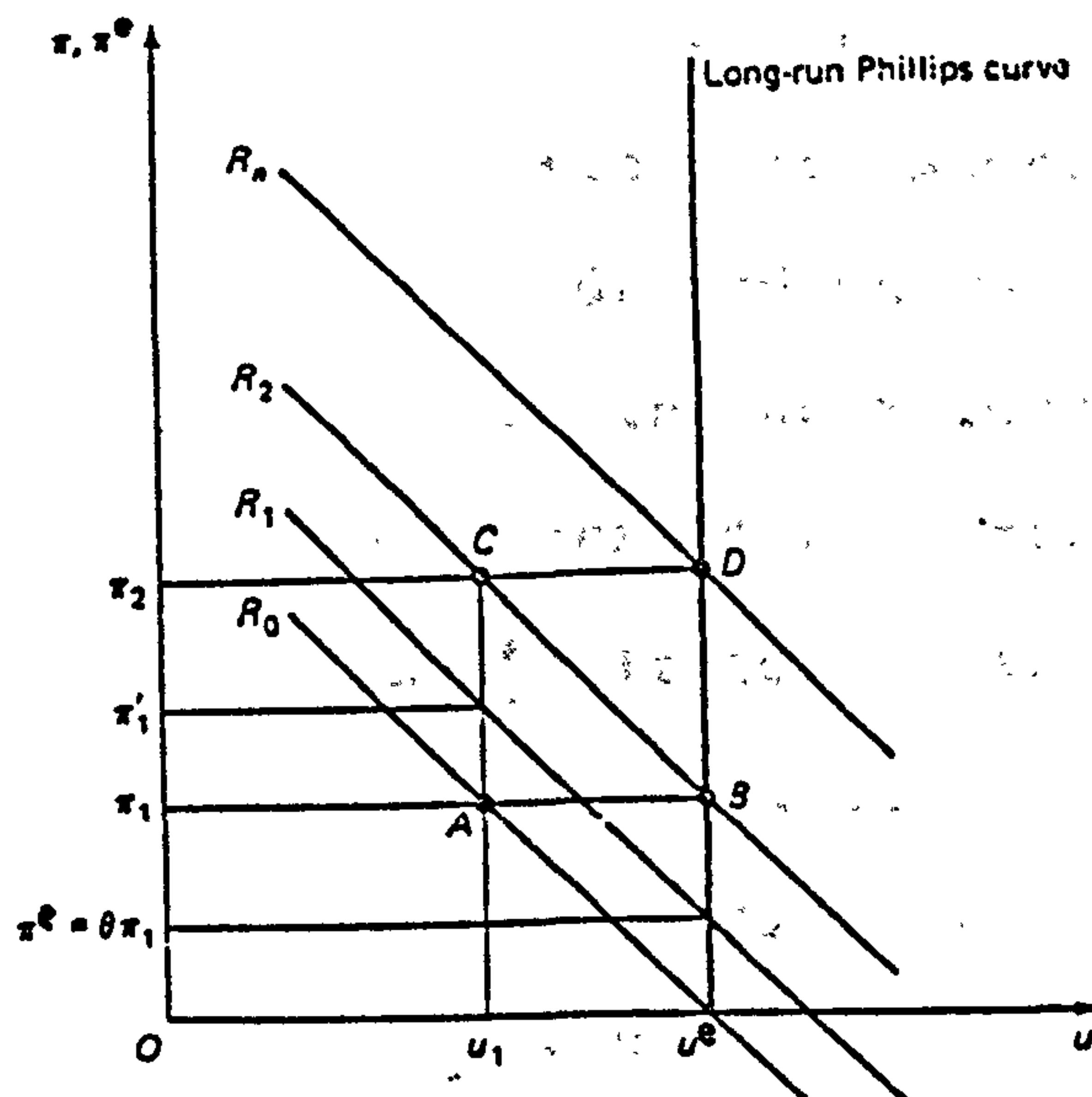


Figure VII-1  
The Phillips curve

Suppose that inflation is  $\pi=0$ , and no excess demand exists. If the unemployment level, for whatever reasons, goes below the level  $u_t^*$  to  $u_1$ , the rate of inflation rises to  $\pi_1$ . This in turn, leads to a gradual increase

in the expected rate of inflation according to equation (2). The Phillips curve  $R_0$  is drawn under the assumption that  $\pi^* = 0$ , and an upward revision of inflationary expectation can be seen from equation (2)  $\pi_1^* = \theta\pi_1 + (1-\theta)0 = \theta\pi_1$ . The process of adjusting expectations shift the Phillips curve from  $R_0$  to  $R_1$ , the process continues as long as the actual rate of inflation  $\pi_t$  is higher than the expected rate  $\pi_t^*$ . Economic policy has at this situation two options : to stop this increase in inflation or to control the unemployment rate  $u_t$ . If the inflation rate is stabilized at the level  $\pi_1$ , the Phillips curve moves to the right towards point B and the rate of inflation is fully anticipated, the expectation error is zero and the following equality holds :  $\pi_t = \pi_t^* = \pi_{t-1} = \pi_{t-1}^*$ . At this steady state no further upward shift occurs, the Phillips curve is stable. If the second option is adopted and the government generates excess demand through fiscal and monetary policies, maintaining the unemployment rate at  $u_1$ , the rate of inflation raises to  $\pi_1'$ , given that the expected rate of inflation  $\pi_t^*$  already equals  $\theta\pi_{t-1}$ . The unexpected part of the actual inflation  $\pi_1' - \theta\pi_1$  causes  $u_1$  to deviate from  $u_t^*$ . By maintaining excess demand at an unemployment rate  $u_1$ , the government generates an accelerating rate of inflation by persistently shifting short-run Phillips curve. In the long-run the NR hypothesis states that expectations are fully adjusted so  $\pi_t - \pi_t^* = 0$  so  $-b(u_t - u_t^*) = 0$  which means  $u_t = u_t^*$ . There is no trade off between the rate of inflation and the rate of unemployment. The natural rate of unemployment  $u_t^*$  is

compatible with different rates of inflation. The conclusion comes from the assumption that the inflation rate is fully expected and remains constant. According to the NR theory, if the unemployment rate is below its natural level there is a short-run trade off between the unanticipated rate of inflation and the rate of unemployment. Only by managing aggregate demand in such a way as to maintain unemployment at the natural level will policy makers be able to avoid accelerating the rate of inflation. The scope of monetary and fiscal policy is restricted. Only a systematic exploitation of the short-run Phillips curve remains possible.

The concept of adaptive expectations is open to two objections :

- 1) It might lead to systematically biased expectations.
- 2) It leads to information being wasted whenever economic agents possess additional information.

To take these considerations into account and to apply the rational expectations to the Phillips curve model, under the NR formulation, we form the following model :

a) The Phillips curve in its NR formulation :

$$\pi_t = \pi_t^e - b(u_t - u_t^e) + \varepsilon_t \quad (3)$$

b) An excess demand equation :

$$u_t = u_t^e - \psi(m_t - \pi_t) + n_t \quad (4)$$

c) Rational expectations :

$$\pi_t^e = E(\pi_t / I_{t-1}) \quad (5)$$

where  $\varepsilon_t$ ,  $n_t$ , are random variables which are serially independent, with constant variances and means zero.

Equation (4) states that an increase in real monetary



expansion  $\psi(m_t - \pi_t)$  (where  $m_t$  stands for the rate of growth of nominal money stock) will generate excess demand and will reduce the unemployment rate  $u_t$ .

Substituting (4) in to equation (3) and solving for  $\pi_t$  gives :  $\pi_t = [\pi_t^* + b(\psi m_t + \varepsilon_t - bn_t)] / (1+b\psi)$  (6)

Applying the expectation operator  $E$  on equation (6) and combining (5) and (6) we have :

$$E(\pi_t / I_{t-1}) = [E(\pi_t / I_{t-1}) + b\psi E(m_t / I_{t-1})] / (1+b\psi) \quad (7)$$

since  $E(\varepsilon_t) = 0$  and  $bE(n_t) = 0$ , equation (7) becomes :

$$(1+b\psi)E(\pi_t / I_{t-1}) = E(\pi_t / I_{t-1}) + b\psi E(m_t / I_{t-1}) \quad (8) \text{ or}$$

$$\pi_t^* = E(\pi_t / I_{t-1}) = E(m_t / I_{t-1}) \quad (9)$$

According to equation (9) under rational expectations the rate of inflation is equal to the expected rate of growth of money supply. By substituting (9) into (4) we have :

$$\pi_t = [(E(m_t / I_{t-1}) + b\psi m_t + \varepsilon_t - bn_t) / (1+b\psi)] \quad (10)$$

Equation (10) implies that if the monetary authorities control the rate of money supply completely and this rate is announced one period in advance we have :

$$E(m_t / I_{t-1}) = m_t \text{ and } \pi_t = E(m_t / I_{t-1}) + (\varepsilon_t - bn_t) / (1+b\psi) \quad (11)$$

Thus according to equation (11) the rate of inflation equals the expected rate of growth of the money supply plus a linear combination of the random variables of the system. Substituting equation (11) into (4) we obtain :

$$u_t = u_t^* - \psi m_t + \psi \{ E(m_t / I_{t-1}) + [\varepsilon_t / (1+b\psi)] - [bn_t / (1+b\psi)] \} + n_t \quad (12)$$

$$\text{or } u_t = u_t^* + [(\psi \varepsilon_t + n_t) / (1+b\psi)] \quad (12a)$$

So the rate of unemployment  $u_t$  equals the natural rate  $u_t^*$  plus a stochastic component. The equation implies that an increase in the rate of growth of the money

supply that is known to the economic agents will raise inflationary expectations leaving unchanged the unemployment rate, thus shifting the short-run Phillips curve. The trade off that is exerted by a systematic economic policy between the unanticipated part of the rate of inflation and the deviation of  $u_t$  from its natural rate  $u_t^*$ , under adaptive expectations, disappears under rational expectations.

#### B The estimated model

Table VII-1 shows the econometric results from testing the real activity model for Greece for the period 1975-83, using quarterly data. To estimate the inflation regression we used as an independent variable the excess demand instead of the change in unemployment. The reasons for this specification are : i) the fact that unemployment became a problem after the year 1981 and ii) adequate data for unemployment are not available.

The rate of unemployment can be connected with the real GDP by Okun's Law :  $u_t - u_t^* = -a(Y_t - Y_t^*)$ . The Law states that the excess of real income over its trend (potential, or anticipated), will reduce the unemployment rate. Thus, it connects directly the excess demand in the goods market with the excess demand in the labor market. According to this Law we can expect the inflation rate to be related positively to the excess demand in the goods market and to the expected rate of inflation.

Table VII-1  
Estimates for the real activity model.

C	$GAP_t$	$GAP_{t-1}$	$\Delta GAP$	$\Delta LP_{t-1}$	$\Delta LP_{t-2}$	$\Delta LP_{t-1}^f$	$\Delta LP_{t-2}^f$	$\bar{R}^2$	DW	SE
.03 (4.7)	.18 (5.1)				.42 (2.6)			.44	1.96	.016
.02 (3.9)	.12 (3.2)				.46 (2.3)	.17 (2.9)	-.11 (-1.6)	.53	1.59	.015
.01 (1.7)	.12 (4.32)	-.10 (-4.3)			.77 (6.0)			.67	1.92	.016
.02 (3.0)	.13 (3.8)	-.06 (-2.1)			.26 (1.90)	.19 (3.2)		.60	2.03	.014
.02 (3.3)	.14 (4.0)	-.07 (-2.3)			.45 (2.3)	.15 (3.1)	-.11 (-2.1)	.62	1.88	.015
.03 (4.5)	.16 (3.1)		.02 (.7)		.41 (2.5)			.43	1.91	.017
.03 (4.2)	.08 (2.7)		.04 (1.4)		.26 (1.7)	.18 (3.1)		.56	2.03	.014
.02 (3.3)	.07 (3.3)		.08 (2.3)		.45 (2.3)	.15 (3.1)	-.11 (-2.1)	.54	1.83	.015

where  $\Delta GAP$  = The change in GAP (as defined in chapter VI).

The  $\Delta GAP$  variable measures the business cycle or capacity utilization, thus it is meant to capture the effect of an upturn or downturn in the economy. Its effect could be positive or negative depending on the power of the upturn or increased capacity utilization. If capacity is increased the coefficient of  $\Delta GAP$  should be negative, otherwise the opposite should occur. The model was extended to include imported inflation. Furthermore lag GAP was used to capture the lagged effects of excess demand on inflation. For expected prices we use either lagged inflation rate or the lag operator. Thus where more than one past value of prices



appears in the table they denote the results from using the lag operator. The estimated regressions show that the explanatory variable of the model is not high. The  $R^2$  ranged between 44% and 67%. However, excess demand plays a significant role along with expected inflation rates both foreign and domestic and the utilization rate. When the lag operator was used the second lag of the foreign prices was negative however the sum of the coefficients of the lagged variables were positive and significantly greater than zero. Domestic inflation had the right sign (positive) when it was lagged two quarters. Lag excess demand had a negative sign, but as in the case of foreign prices the sum of its current and past values were positive.

### C) Money supply output and rational expectations.

To test the hypothesis of the ineffectiveness of demand management policies to influence unemployment and real output under rational expectations, we adopted two different approaches. The first model we estimated, is a shorter version of the Brunner and Meltzer (1976a,b) model which was used to explain inflation rates and output growth in the Netherlands. The second model was used by Barro (1981) for the U.S.A economy.

#### 1. Model I

The first model traces the transmission of systematic economic impulses to prices and output for an open managed exchange rate economy predicted on the assumptions of rational economic behaviour and rational formation of expectations. The model was used to test the contention that there is a causal relationship from

money to prices and output and that the variability of monetary impulses dominates fluctuations in the level of prices and output relative to the variability of fiscal, and foreign impulses.

Aggregate supply and demand for the private sector is given by equation (15) and (16) respectively.

$$\Delta LY_t = \Delta L\bar{Y}_t + a_1 (\Delta LP_t - \Delta LP_t^e) + u_s \quad (15)$$

$$\Delta LY_t = b_1 (\Delta LM_t - \Delta LP_t^e) + b_2 (\Delta LP_t^f) + b_3 FI + b_2 \Delta Le_t + u_d \quad (16)$$

where  $\bar{Y}$  = the normal level of private production.

FI = a linear combination of proportionate

rates of change of discretionary real

government expenditure and taxes.

ud, us = random shift terms reflecting changes in

rates, productivity etc.

Combining equations (15) (16) and solving for the price level we obtain :

$$\Delta \log P_t = 1/A [ -\Delta \log \bar{Y}_t + b_1 \Delta \log M_t + b_2 (\Delta \log e_t + \Delta \log P_t^f) + b_3 FI + (a_1 - b_1) \Delta \log P_t^e + u ] \quad (17)$$

where  $A = a_1 + b_2$ ,  $u = u_d - u_s$ .

Under rational expectations the rate of expected inflation is an unbiased predictor of actual inflation given all the information available just before the start of the period to which the expectations applies.

The mathematical expectation of (17) gives :

$$\Delta LP_t^e = 1/B [ -\Delta L\bar{Y}_t + b_1 \Delta LM_t^e + b_3 FI^e + b_2 (\Delta Le_t^e + \Delta LP_t^{f,e}) ] \quad (18)$$

where  $B = b_1 + b_2$

Rational expectations mean that the coefficients of actual and expected nominal variables sum to unity,

implying homogeneity of degree one of actual and expected inflation in these nominal impulses. This means that there is no money illusion, by assuming super-neutrality of money.

Subtracting from both sides of equation (17) the term  $\Delta LP_t^e$  and substituting into equation (18) we have :

$$(\Delta LP_t - \Delta LP_t^e) = 1/A \{ [ b_1 (\Delta LM_t - \Delta LM_t^e) + b_2 [ (\Delta Le_t + \Delta LP_t^f) - (\Delta Le_t^e + \Delta LP_t^{f,e}) ] + b_3 (FI - FI^e) ] + u \} \quad (19)$$

This equation implies that deviations of actual from expected inflation can occur because of random events or unforeseen movements in the systematic foreign, monetary and fiscal impulse forces, resulting from imperfect or asymmetric information. The divergence between actual inflation and the expected one is due to random forecast error which is uncorrelated with everything known before the beginning of the period to which the forecast applies.

Combining equations (15) and (19) and solving for the output level we have :

$$\Delta LY_t = \Delta \bar{LY}_t + a_1/A \{ b_1 (\Delta LM_t - \Delta LM_t^e) + b_2 [ (\Delta Le_t + \Delta LP_t^f) - (\Delta Le_t^e + \Delta LP_t^{f,e}) ] + b_3 (FI - FI^e) \} + (a_1/A) u_d + (b_2/A) u_s \quad (20)$$

According to (20) deviations from output's normal growth path result from random demand and supply shifts or from unforeseen systematic fiscal, foreign and monetary impulses because of imperfect information. Systematic impulses, if foreseen have only price effects. Thus there is no systematic way that the government can operate its fiscal, monetary impulses to stimulate



output growth above its nominal level. The only effect is on inflation.

a) The results from the estimated model

For empirical testing the anticipated rate of inflation is generated by the systematic part of the regression equation of the form of eq.(18) in which the current rate of inflation is regressed on the anticipated levels of systematic impulses,  $\Delta LM_t^e$ ,  $\Delta Le_t^e$ ,  $+\Delta LP_t^e$ ,  $FI^e$ ,  $\Delta LY_t^e$ . This estimate of expected inflation is used to estimate an equation of the form of (19). We estimate the regression with the coefficient of  $\Delta LP_t^e$  constrained to unity, that is the unanticipated inflation rate  $\Delta LP_t - \Delta LP_t^e$  is regressed on the unforeseen parts of systematic impulses. Finally we regress measures of  $\Delta LY_t - \Delta \bar{LY}_t$  on the unanticipated parts of the systematic impulses.

To measure the expected variables two approaches were used :

a) We assume that the economic agents expect the economic impulses to remain unchanged from the previous period.

b) We fit an ARIMA process to all economic impulses. If  $I$  represents the change in impulses from the ARIMA process we obtain  $I_t = I_t^e + \varepsilon_t$ , where  $\varepsilon_t$  is a white noise series, thus  $I_t - I_t^e = \varepsilon_t$  are serially independent forecast errors.

As far as the normal growth rate of output is concerned either we can assume that  $\Delta \bar{LY}_t$  is a constant term, or we can use the above mentioned two approaches.

For the fiscal measure  $FI$  the quarterly changes in the

central governments budget structural deficit ( $\Delta DSQ$ ) as a percentage of the previous period's gross national income was used. This measure of fiscal impulse differs from the one that was used by Brunner and Meltzer in that it does not exclude changes in government imports of foreign goods and services, thus indicating the budget impulse on the domestic output. However, quarterly data on these variables were not available.

The results from regressing the actual inflation rate on the expected impulses using an ARIMA process and past values for the specification of expectations are given by the following equations respectively.

$$\pi = .02 + .71 \Delta LM_t^e + .06 FI_t + .11 \Delta L(e P^f)_t^e + .02 T$$

$$(6.2) \quad (4.1) \quad (3.5) \quad (1.8) \quad (4.3)$$

$$\bar{R}^2 = .58, \quad DW=1.9, \quad SE=.0104 \quad (21)$$

$$\pi = .82 \Delta LM_{t-5} + .07 FI_{t-4} + .12 \Delta L(e P^f)_{t-3}^e + .03 T$$

$$(3.5) \quad (4.4) \quad (3.6) \quad (2.1)$$

$$\bar{R}^2 = .53, \quad DW = 2, \quad SE=.0110 \quad (22)$$

According to these equations expectations play a role in determining the rate of inflation. The  $\bar{R}^2$ 's, however were much higher for the Netherlands (e.g.  $\bar{R}^2 = .70$ ). The coefficient of fiscal impulse is very small for Greece. However, when this variable was dropped, the explanatory power of the regression was reduced, thus we kept the variable. Furthermore, the sum of the coefficients is not statistically different from unity. This implies that expectations are formed rationally and free from money illusion.

The following table summarises the results from regressing unanticipated inflation (measured by the

residuals of equation 21), on the three unanticipated impulses, measured from the results of fitting an ARIMA process. (The first equation was used because it gave the best statistical results).

Table VII-2

const	$\Delta$ LMU	FIU	$\Delta$ L(e Pf)U	Time	DUM2	$\bar{R}^2$	DW	SE
-.01 (2)	.01 (.24)	.84 (.44)	0.14 (2.19)	.52 (2.5)	.21 (3.1)	.60	2	.0123
-.11 (1.6)	.22 (.70)	.9 (.51)	.7 (2.1)	.4 (1.3)		.60	1.8	.0111
-.22 (7.1)	.21 (.40)	.014 (.51)	.69 (2.67)			.61	1.6	.0109
-.1 (5)	.9 (.21)	.9 (.50)	.11 (2.2)	.57 (1.5)		.61	1.9	.0123

DUM2 is a dummy variable which was used to capture the effects on inflationary expectations after the new government took office (it was defined in the previous section).

Table VII-2 shows that unanticipated changes in foreign prices and the dummy variables have influenced unanticipated inflation only.

Table VII-3, represents the estimates of running a regression of actual inflation rate on anticipated inflation (measured by the estimated equation 21) and the unanticipated impulses, all measured using the ARIMA models, since they gave the best result.

Table VII-3 shows that the expected inflation rate is



Table VII-3

const	ΔLMU	FIU	ΔL(e Pf)U	Time	DUM2	$\pi^e$	$\bar{R}^2$	DW	SE
-.2 (1.7)	-.39 (.47)	.67 (.31)	-0.53 (1.18)	.4 (.5)	.21 (.89)	1.6 (2.64)	.60	2	.0123
-.2 (1.8)	.45 (.7)	.15 (.7)	.6 (1.7)	.8 (2)		1.32 (4.5)	.59	1.7	.0114
-.1 (1.2)	-.21 (.4)	-.4 (.5)	.69 (1.6)			1.94 (4.7)	.55	1.6	.0113
-.2 (1.8)	-.03 (.50)	.6 (.32)	.5 (1.4)	.01 (1.9)		1.8 (5.5)	.60	1.9	.0110
-.2 (1.6)			.6 (1.7)	-.04 (1.5)		1.5 (6)	.45	1.6	.0128

the only determinant of the inflation rate. This means that the assumptions of the monetarists do not apply to the Greek case. If the opposite was true then we could expect the dummy variable, the unanticipated changes in the foreign prices and the expected inflation to be the three dominant explanatory variables. Furthermore, we could expect that the coefficient of the expected inflation rate not to be significantly different from unity. In our case this does not hold. If the coefficient of anticipated inflation rate was not significantly different from unity, we could argue that the unanticipated impulses used to explain unexpected inflation are uncorrelated with the measure of inflationary anticipations. This in turn, would imply that we have been successful in isolating the major determinants of inflationary expectations and constructing correct measures for anticipating and

unanticipating inflation. Finally, the low  $R^2$  imply that other determinants are needed to explain the inflation rate.

The results from the regression of industrial output on the unexpected impulses are summarized in Table VII-4. We used industrial output since the statistical results were more satisfactory than the total output.

The unexpected impulses when the past values were used for the formation of expectations are given by the following expressions :

$$\Delta \log(e P^f)_U = \Delta \log(e P^f)_t - \Delta \log(e P^f)_{t-3} \quad (23)$$

$$\Delta \log YIDU = \Delta \log YID_t - \Delta \log YID_{t-4} \quad (24)$$

$$\Delta \log MU = \Delta \log M_t - \Delta \log M_{t-5} \quad (25)$$

$$FIU = FI_t - FI_{t-4} \quad (26)$$

where YID=Real industrial production.

When the ARIMA estimates for the expectations were used for the output regressions the results were statistically insignificant.

Table VII-4

const	ΔLMU	FIU	ΔL(eP <sup>f</sup> ) <sub>U</sub>	ΔLYU <sup>f</sup>	Time	DUM2	$\bar{R}^2$	DW	SE
.01 (1.5)	-.43 (1.9)	-.04 (.96)		-.47 (1.3)		.01 (.52)	.66	1.7	.0123
	-.53 (2.53)	.05 (1.42)	-.12 (1.21)	-.52 (1.3)	.001 (1.9)	-.02 (1.3)	.67	1.7	.0109
	-.58 (2.57)		-.09 (.93)	-.59 (1.46)	.002 (1.8)	.02 (1.4)	.66	1.8	.0140
.09 (1.4)	-0.45 (2.3)			-.53 (1.28)	.003 (1.9)	-.03 (1.5)	.60	1.7	.0150

The results imply that unexpected changes in money supply are the main determinants of unexpected changes in industrial production. However, the coefficient of this variable has the opposite than expected sign. This negative sign may be attributed to the distortions caused in financial repressed economies. The variable  $\Delta LYU^f_t = \Delta LY^f_t - \Delta LY^f_{t-4}$ , is the rate of growth of USA's output and represents the influence of the growth rate of the GDP of industrialized countries on the domestic industrial production. It was used because of the alleged influence of this variable on the growth of less industrialized countries.

The results from fitting ARIMA models are:

$$\Delta L_e(1 - .537B^4) - 1.18 = u1_t \quad (27)$$

(3.1) (2.41)

$$\Delta LP^f(1 - .503B^4) - .008 = u2_t \quad (28)$$

(2.54) (2.96)

$$\Delta LY^f(1 - B) = (1 - .947B) u3_t \quad (29)$$

$$FI(1 - B^4) - .06 = (1 - .973B) u5_t \quad (30)$$

(2.43) (7.6)

$$\Delta LM(1 - B)(1 - B^4) = (1 - .62B)(1 - .868B^4) u6_t \quad (31)$$

(4.9) (4.46)

$$\Delta LYID(1 - B^4) + .003 = (1 - .868B)(1 - .868B^4) u7_t \quad (32)$$

(6.6) (4.2) (5.1)

## 2. Model II

This second model was used by R. Barro (1981) to



estimate to what extent unanticipated money growth affects output and the price level in U.S.A.

The form of the output equation is given by :

$$LY_t = c_1 + a_i \Delta LMU_{t-i}, \text{ where } i=0, 1, \dots \quad (33)$$

$$\text{and } \Delta LMU_{t-1} = \Delta LM_{t-1} - \widehat{\Delta LM}_{t-1} \quad (34)$$

$$\Delta LM_t = g_1 + g_j \Delta LM_{t-j} + d_1 GED + d_2 UN_{t-1} \quad (35)$$

$j=1, 2, \dots$

According to equation (33) real GDP is estimated by current and past unexpected changes in nominal money stock ( $\Delta LMU_{t-1}$ ). Expected changes in M, according to (35), depend on past changes in M, ( $\Delta LM_{t-j}$ ), the ratio of real government expenditures to their trend level (GED), and a variable which captures the cyclical effects and is given by  $UN = L[U/(1-U)]$ , where U is the unemployment rate in the total labor force. Unexpected changes in money stock is given by equation (34) (as the difference between actual changes and the systematic part of the regression equation of the form of (35)).

To derive the equation for the price level the following demand for money equation was used.

$$LM_t - LP_t = b_0 + b_1 L(X_t) - b_2 \pi_t^e + b_3 T \quad (36)$$

where X is a measure of real expenditure pertinent to money demand.

The real expenditure (X) determinant of money demand is assumed to be linearly related to real GDP for a given value of real purchases of goods and services, G. An increase in G reduces the volume of expenditure pertinent to money demand for a given value of total GNP. So X is inversely related to G,  $X = c(Y - \gamma G)$  (37) where  $c > 0$  and  $0 < \gamma < 1$ , substituting (37) into (36) and

solving for the price level we have :

$$LP_t = c_0 + LM_t - b_1 L(Y - \gamma G) + b_2 \pi_t^e \quad (38)$$

The following assumptions are implied from equation (38) :

- 1) There is a one to one effect of  $LM_t$  on  $LP_t$ . Systematic changes in  $M$ , holding  $Y$  constant have equiproportionate, contemporaneous effects on the price level.
- 2) Unexpected changes in money stock have negative effects on the price level via  $Y$ , for given values of  $M_t$ ,  $\pi_t^e$ ,  $G$ ,  $T$ .
- 3) If money demand is unit elastic in real expenditure  $b_1=1$ , the pattern of  $\Delta LMU_t$  has the same effect on both the output and price equation.
- 4) Lagged values of the money stock or lagged values of actual money growth are irrelevant to the determinants of the price level.

The estimated regressions for Greece, of the model are given in the following equations:

$$\begin{aligned} \Delta LM_t = & .023 + .64\Delta LM_{t-1} + .26\Delta LM_{t-2} - .38\Delta LM_{t-3} \\ & (3.5) \quad (4.9) \quad (1.56) \quad (2.18) \\ & + .06GED + .05GAPD_{t-1} \quad (39) \\ & (5.52) \quad (1.84) \end{aligned}$$

$$\bar{R}^2 = 75\%, \quad DW = 2.1 \quad SE = .0123$$

As it has already been explained in the beginning of this chapter, in a country which has not experienced problems of unemployment, the variable  $GAPD$  captures in a better way the cyclical effects than the  $UN$ . Thus we used the former to estimate our model.

According to equation (39) changes in money stock

are explained mainly by past changes in money stock. The ratio of real government expenditure to normal (where as a normal level the trend government expenditure was used) and the cyclical variable GAPD (= change in the deviation of real GDP from its trend level lagged one period), although statistically significant, have a small effect indicated by their coefficients.

From the systematic part of this regression the unexpected changes in money stock were estimated ( $\Delta LMU_t = \Delta LM_t - \hat{\Delta LM}_t$ ), the regression of real GDP on current and past values of  $\Delta LMU$  gave the following results :

$$LY_t = 12 + .89\Delta LMU_t + .87\Delta LMU_{t-1} - 1.55\Delta LMU_{t-2} \\ (3.8) \quad (.52) \quad (.87) \quad (.6)$$

$$- 2.6\Delta LMU_{t-3} \quad (40) \\ ((1.36))$$

$$R^2 = .94, \quad DW = 1.7 \quad SE = .0170$$

According to this regression unexpected changes in the money supply have no effect on real GDP.

The results from the regression of real GDP on actual past changes in the money stock were :

$$LY_t = 12 + 1.85 \Delta LM_{t-1} - 1.83\Delta LM_{t-2} + .43T \quad (41) \\ (1.67) \quad (2.7) \quad (2.67) \quad (2.8)$$

$$\bar{R}^2 = .34 \quad DW = 1.8 \quad SE = .0125$$

As it is clearly seen actual changes in money stock have an effect on real GDP, but according to the sum of the coefficients this effect is relatively small.

Finally, to test the interdependence between prices,  $y$ , money supply and government expenditure, we use the



equations of the model as specified before but for the expected variables, instead of the unexpected. Moreover to denote the relation of  $Y$  and  $G$  we modified the  $Y$  equation to include  $GED$  or expected  $GED$ .

The results are given by the following estimated regressions, using the FIML method:

$$LP_t = -9 + LM_t - .25L(Y - .5G) + .007T + 1.08\pi_{t-2} \quad (8) \quad (2.48) \quad (7) \quad (4.54)$$

$$+ .02 \Delta L(eP^f)_{t-2} \quad (42)$$

$$(4.2)$$

$$LY_t = 12 + 1.754\Delta LM_{t-1} - 1.750\Delta LM_{t-2} + .007GED \quad (43)$$

$$(1.53) \quad (2.26) \quad (2.9) \quad (2.56)$$

$$DLM = .78 + .56 DLM_{t-1} + .03 DLM_{t-2} - .02 DLM_{t-3} + .07 GED$$

$$(4.1) \quad (4.9) \quad (2.2) \quad (4.2) \quad (3.1)$$

$$+ .04 DGAP_{t-1} \quad (44)$$

$$(1.5)$$

According to the above estimations expected changes in the money stock determine  $Y$  and  $P$ . However, expected changes in money stock have a minor effect on output, according to the sum of their coefficients, .004. Price expectations affect inflation with a two quarter lag.

The two models which were employed to examine the monetarist theory of money output and inflation failed to give any support to the arguments of this theory

that systematic changes in money stock affect price levels only leaving, thus unchanged the output. Furthermore there was not enough evidence that monetary impulses dominate the fiscal ones or the opposite.

#### D) Conclusions

In this chapter we tested the real activity models for the determination of inflation and the monetary considerations with respect to the inflation rate and output in Greece.

The real activity models postulate that the inflation rate is determined by the expected inflation rate and the excess demand and that both exert a positive effect on it. To test these issues for Greece we extended the original model to include imported inflation and the business cycle or capacity utilization. We found out that excess demand, the expected inflation rates both foreign and domestic, and the utilization rate are the statistically significant variables in the inflation rate equation. However, we consider that the real activity models cannot be used to explain the behaviour of inflation in Greece since, the explanatory power of all the estimated equations was very small compared with that of the excess supply of money models. Thus, excess supply of money is the main determinant of the high inflation rates that prevailed after 1974.

Finally, we found out that the monetary approach to price and output behaviour cannot explain the movements of these variables in Greece. This means that systematic changes of fiscal and monetary policies do affect prices

and output and no evidence exists that monetary impulses dominate the fiscal ones.



## CHAPTER VIII

Concluding remarks

The purpose of the study was to examine the consequences of the fiscal deficit in the Greek economy. Given that an adequate examination of these consequences requires the explicit definition of the economic target of the policy makers, the emphasis was, as it has been already mentioned, on the inflationary, crowding out/in and the balance of payments issues emerging from the budgetary policies.

After describing the different methods that we can use to measure the fiscal stance in chapters one and two, the Greek monetary system was described in chapter three. In this chapter we presented the argument that the public sector was the main source of the increase in the monetary base and money supply, especially after 1974. Furthermore, we used a simplified version of Demopoulos (1981) theoretical model to describe the institutional characteristics of the monetary system and its relations with the budgetary policies.

In chapter four three different measures were estimated and could be used to assess if the actual budget was contractionary or expansionary and taking into account the prevailing economic situation of the period under examination, when the budget deficit attributed to the inflationary and crowding out pressures of the economy. The three measures used were a modified version of three national measures that is the F.E.S, the Dutch and

the German approach to the measurement of fiscal stance. We left out the Swedish measure, since it is mute on the particular economic structure of the country. Although the three measures are inferior to the W.S.S we use them because they do not need the construction or the existence of detailed large scale macroeconomic models. To justify the need and the utility of these measures we mention that many macroeconomic models already exist for Greece. Since some of them cover the same period examined in this thesis, and it would be unnecessary to add another one in the list. Furthermore, the different assumptions and the subsequent different results underlying these models makes it very difficult to use any one of them in order to estimate the W.S.S. The different measures do not weight the different taxes and expenditures, which as have been already mentioned, consists the major drawback of the summary measures. The use of weights would involve the use of detailed macroeconomic models, which in turn would involve a priori assumptions of the distribution of income, groups of income earners which use the different public expenditures etc. The need for these assumptions comes from the unavailability of data or from the lacking of data for a period long enough for estimation purposes.

The measures were calculated using the elasticities from the estimation of simple regressions, the adequacy of which was tested with the help of the causality test as developed by Pierce-Haugh. Different theoretical assumptions form the base of the measures and as such they can be used only indepedently from each other.



The first measure, the structural deficit, uses only a base year, the first year of the period under examination and it does not impose any restrictions as far as the taxes or the expenditures that should be included in its calculation are concerned. The Dutch measure needs certain assumptions for the inflationary expenditures, the definition of which can be very complicated under inflationary periods. Finally, the CNB is based on the constancy of the great ratios of the economy. For its construction we should define what ratios the authorities would like to keep constant and as a target. Thus we argue that the structural budget is superior to the other two measures, given the nonexistence of a priori restrictions imposed for its estimation.

According to our results from the structural budget, the change in the conventionally measured budget deficit is a false indicator of fiscal stance only for the years 1966, 1969 and 1975. Thus the inflationary pressures of the budget after 1973, were reduced in 1974, 1975, 1977, 1978, 1980, 1982, and 1983. This result is obtained from the change of the structural deficit when it was corrected for the inflation depreciation of the government debt. We should mention that we use this change of the budget to see if the budget became restrictive or expansionary after the emergence of the inflationary pressures in the economy and not how restrictive/expansionary it was. Moreover, we have found a crowding out effect for the whole period under examination except for the years 1963 and 1978. The



crowding out pressure was reduced in 1974, 1975, 1977, 1978, 1980 and 1982. This conclusion comes from the change of the structural budget corrected to present its crowding out/in implication. Thus the fiscal policy became restrictive after the emergence of the inflationary pressures except in the years 1976, 1979 and 1981. This expansionary fiscal policy coincided with the effects on the economy of the second oil crisis and the election period for the years 1979 and 1981, respectively.

Finally, for our quarterly estimates of the structural deficit we have found that the structural budget is negative in the second quarter of 1975 and the first quarter of each year and in surplus in all the other quarters except the above mentioned. The conventionally measured budget is in deficit throughout the period. According to the signs of the change in the two measures of fiscal stance we argue that the conventionally measured deficit is a misleading indicator of fiscal stance since it has the opposite sign than the structural budget in 19 out of the 35 quarters under examination.

In chapter five we examined the relations between private and public investment, inflation, money supply and credit. We disaggregated private investment expenditures to investment in machinery and equipment and buildings in manufacturing, agriculture, residential buildings, trade and the rest of the private sector. For the investments of the public sector we used the total investment expenditures of it and its components that is

investment in infrastructure and its components (investment in energy, transportation and communication), investment other than in infrastructure. Drawing our attention on the total of the public investment, we found that its rate of change crowds out investment in machinery and equipment, agriculture, trade and the rest of the private investment, while its actual level crowds out investment in trade. Expected and unexpected public investment exerts a crowding out effect in investment in trade. The deviation of the actual level from its trend crowds out investment in trade and the rest of the private sector, while the trend level crowds out investment in trade. From the estimated coefficients we can see that the total effect of public investments on the private investment is positive thus indicating a crowding in effect. We argue that the different specifications of government investment expenditures can be used according to the time horizon of the policy maker. So the actual level and its rate of change from one year to the other can be used for short-run policy purposes while the expected and unexpected for medium-run policies. The trend level and the deviation of the actual level from its trend embodies short medium and long-run issues for the implications of government investment expenditures on the different categories of private investment.

The ratio of actual inflation over its expected value exerts a positive effect in all the private investment categories except in investment in trade. Moreover the excess supply of money affects positively



the inflation rate. On the other hand money supply is affected significantly from the public deficit.

Our findings that private investments are affected positively from the rate of change in credit and the expected investment in the other sectors implies that the monetary and fiscal policies can be used in such a way as to promote the growth of investment in strategic sectors of the private sector such as investments in manufacturing. The most important finding is the positive relation of the real interest rate and the investment in residential buildings which in turn affect positively the investment in manufacturing. To this we should add that a low inflation rate can promote the growth of investment (except those in trade), while high inflationary expectation can undermine them.

We should mention that the estimated coefficients of the model represent either elasticities or semielasticities. Since the estimated equations proved to explain the investment behaviour in the logarithms of the variables only and given the lags involved it becomes extremely difficult, not to say impossible, to calculate the reduced form of the model in order to estimate the impact of the investment and/or budgetary policy on the economy as a whole. However this does not make the model less useful since it gives indications of the working of the relationships between investment in the different sectors of the economy public, investment inflation (actual and expected), monetary policies and the interrelationships between the different investment categories of the private sector. Furthermore we can



estimate the direct effects of the public investment expenditures on the different categories of private investment. The same holds for the credit variable.

Thus we can say that a crowding in effect of the government investment expenditures on the private ones exists in the Greek economy and that crowding out can occur through monetary policies and their dependence on the budgetary policy.

Chapters six dealt with the interrelationships of the government deficit, inflation, output and the balance of payments. The monetary approach to the balance of payments proved to be unable to explain the short-run behaviour of the above mentioned variables and the same holds for the second approach which concerns the current account of the balance of payments and the alternative approach to the balance of payments. However, the fact that the models cannot be used for prediction purposes does not mean that they do not give any useful indications for the connections of the variables in consideration. Thus we have found that inflation is affected mainly by the excess supply in money while the demand for money is positively affected by expected income and negatively by the rate of expected inflation. Moreover, government expenditure either defined as the unexpected ones or their actual level affect positively the real output, and absorption. Finally, we have found that the fiscal deficit has a direct effect on the balance of the current account of the balance of payments. Our findings imply that the problem of inflation and the imbalances on the balance

of payments accounts are due to the domestic structural characteristics of the economy, in particular the fiscal deficits.

The not well established results from the chapter six urge us to test the models of real activity and the monetaristic considerations as far as the role of monetary and fiscal policy on output and inflation are concerned. The real activity models had a poor explanatory power, while the monetarist considerations for the output and expected inflation failed to explain the inflation and output behaviour in Greece.

## Data

The data used to estimate Tables III-4 to III-8 in Chapter III were taken from various issues of the monthly statistical bulletin of the Bank of Greece.

In chapter IV the annual data covering the period 1960-81 and concerning the deficit of the central government and the composition of the expenditures and revenues, for the estimation of Tables IV-1 to VI-11 were taken from "The Greek Economy" published (in Greek) by the Bank of Greece (1982). The deficit/surplus of the accounts that the central government keeps with the bank of Greece, and the data for the debt for the period 1960-83 and the deficit and the composition of the revenues and the expenditures of the central government for the years 1982 and 1983 were taken from various issues of the monthly statistical bulletin of the Bank of Greece.

The data for the quarterly deficit and the revenues and expenditures of the central government were taken from the International Financial Statistics of the International Monetary Fund and were seasonally adjusted.

The data for the private and public investments and its categories as defined in chapter V, and the depreciation and the capital stock used to estimate the regressions and the tables in the above chapter were taken from the Center of Planning and Economic Research, Athens 1982. The Credit variables, the private consumption index, the interest rates, and the wage index were taken from "The Greek Economy".



In chapters VI and VII the data for the different versions of the Greek and U.S.A income or output and the current account were taken from the Ministry of National Economy "Quarterly National Accounts of Greece 1st Quarter-1st Quarter 1984" Athens July 1984. The data for the GNP were estimated using the quarterly data for the Gross National Income from the above mentioned source and adding the gross indirect taxes using the extrapolation method for converting them into quarterly. All other data as defined in different sections of chapters VI and VII were taken from the International Financial Statistics of the International Monetary Fund. All the quarterly data were seasonally adjusted.

## BIBLIOGRAPHY

- Aghevil, B. & Khan, M. S. (1977) " Inflationary Finance" American Economic Review, 67, 390-417.
- Anderson, L.C. and Jordan, J.L (1968) "Monetary and Fiscal Actions: A Test of their Relative Importance in Economic Stabilization" Federal Reserve Bank St. Louis Review
- Ando, A & Modigliani, F. (1963) " The Life Cycle Hypothesis of Saving: Aggregate Implications and Tests" American Economic Review, 53
- Archibald, G.C. & Richmond, J. (1971) "On the theory of foreign exchange reserve requirements" Review of Economic Studies 38
- Argy, V. (1970) "Stuctural Inflation in Developing countries" Oxford Economic Papers, 22, NO 1, New series.
- \_\_\_\_ & Porter, M.G. (1972) "The Forward Exchange Market and the Effects of Domestic and External Disturbances under Alternative Exchange Rate Regimes" International Monetary Fund Staff Papers
- \_\_\_\_ & Salop, J. (1979) "Price and Output Effects of Monetary and Fiscal Policy Under Flexible Exchnge Rates" International Monetary Fund Staff Papers, 26.
- Arestis, P. (1978) "The Dynamic Impacts of Governemnt Expenditures and Monetary Aggregates. The case of four O.E.C.D countries". Public Finance, 33.
- Artis, M.J. & Lewis, M.K. (1976) "The Demand for Money in the United Kingdom 1963-73" Manchester School,

Artis, M. J. & Miller, H. H. (1980) "Fiscal and Monetary Policy"

Artis, M.J. & Currie, D. A. (1981) "Monetary and Exchange Targets" in Monetarism : Traditions, Debates and Policy ed. Courakis, A. S. and Harrington (London: Mcmilan)

Artis, M.J. (1982) "Demand Management, Supply Constraints and Inflation "

Artus, J. R. (1977) "Measures of Potential Output in Manufacturing for Eight Industrial Countries, 1955-78" International Monetary Fund, Staff Papers, 24.

Asher, Mukul (1973) "The concept of Fiscal Policy Performance of the Government in India, 1950-51, 1966-67". Dissertation Abstract

Auld, D. A. L. (1967) "A Measure of Australian Fiscal Performance 1948-64" Economic Record

\_\_\_\_\_ (1969) "Fiscal Policy Performance in Canada 1957-67" Public Finance

\_\_\_\_\_ (1971) "Automatic Fiscal Stabilizers: Problems of Identification and Measurement" Public Finance, 26.

\_\_\_\_\_ (1969) "The Economic Impact of Built in Changes in Budget Components" Australian Economic Papers, June 1969, section 3.

Bacon, R. & Eltis, W. (1976) Britain's Economic Problem: Too Few Producers London, Macmillan

Barro, R. J. (1974) "Are Government Bonds Net Wealth?" Journal of Political Economy, 82

\_\_\_\_\_ (1976a) Money, Employment and Inflation Cambridge



University Press

- \_\_\_\_ (1976b) "Rational Expectations and the Role of Monetary Policy" Journal of Monetary Economics, 2
- \_\_\_\_ & Gordon, D. (1983) "Rules, Discretion and Reputation in a Model of Monetary Policy" Journal of Monetary Economics
- \_\_\_\_ (1981) "Unanticipated Money, Output, and the Price Level in the United States " in Rational Expectations Lucas and Sargent ed.
- Baumol, W.J. (1952) "The Transactions Demand for Cash: An Inventory Theoretic Approach" Quarterly Journal of Economics, 66
- \_\_\_\_ and Peston, M.H. (1955) " More on the Multiplier Effects of a Balanced Budget" American Economic Review
- Behran, J. R. (1972) "Sectoral Investment Determination a in Developing Economy" American Economic Review, 62.
- Ben-Zion, Uri. (1975) "Money in Production function" Review of Economics and Statistics, 57: 3
- Biehl, D. "Measuring the Demand Effects of Fiscal Policy" Fiscal Policy and Demand Management Giersch, H. ed.
- Bigman, D. & Taya, T. (1980) ed. The Functioning of Floating Exchange Rate: Theory, Evidence and Policy Implications Ballinger Publishing Company Cambridge, Massachusetts
- Blejer, M. (1981) "Exchnge Rate Changes as a Stabilization Instrument" International Monetary Fund Staff Papers 28.

\_\_\_\_\_ & Khan, M. S. (1984) "Investment and Government in developing Countries" International Monetary Fund Staff Papers 31, No 2.

Blinder, A. S. and Goldfield, S. M. (1976) "New Measures of Fiscal and Monetary Policy" American Economic Review, 66

Blinder, A.S & Solow, R.M. (1973) "Does Fiscal Policy Matter ? " Journal of Public Economics, 2

\_\_\_\_\_ (1974) "Analytical Foundations of Fiscal Policy" in The Economics of Public Finance ed. The Brookings Institution Washington, D.C

\_\_\_\_\_ (1976) "Does Fiscal Policy Matter ? A Correction" Journal of Public Finance, 5.

\_\_\_\_\_ (1978) " What's New and What's Keynesian in the New Cambridge Keynesianism " in Public Policies in Open Economies ed. Brunner, K. and Meltzer, A. H. (Carnegie-Rochester conference Series, 9, Amsterdam: North-Holland)

Bomberger, W. A. (1975) "Wage determination, Inflation and Industrial Structure" American Economic Review, 65.

\_\_\_\_\_ & Makinon, G. E. (1979) " Some Theoretical Tests of the Harberger Inflation Model Using Quarterly Data" Economic Development and Cultural Change, 27, No 4.

Box G.E.P. & Jenkins, G.M. (1970) Time Series Analysis Holden Day Inc.

Branson, W. H. (1972) Macroeconomic Theory and Policy New York

\_\_\_\_\_ (1983) "Economic Structure and Policy for External Balance" International Monetary Fund Staff Papers

30.

Brown, E. C. (1950) "Analysis of Consumption Taxes in Terms of the Theory of Income Determination" American Economic Review, 40.

---- (1956) "Fiscal Policy in the Thirties : a Reappraisal" American Economic Review 46

Brunner, K. & Meltzer, A. H. (1963) "Predicting Velocity: Implications for Theory and Policy" Journal of Finance, 10

\_\_\_\_\_ (1964) "Some Further Evidence on supply and Demand Function for Money" Journal of Finance, 19

\_\_\_\_\_ (1972) "Money, Debt and Economic Activity" Journal of Political Economy, 80

\_\_\_\_\_ (1976a) "An Aggregate Theory for a Closed Economy" in Monetarism, ed. Stein, J.L. (Amsterdam: North-Holland)

\_\_\_\_\_ (1976b) "Monetary and Fiscal Policy in Open, Interdependent Economies" eds. Claassen, e. and Salin, P. Amsterdam: North-Holland

\_\_\_\_\_ (1978a) ed. Public Policies in Open Economies Carnegie - Rochester Conference Series on Public Policy North Holland

\_\_\_\_\_ (1978b) "The Problem of Inflation" in The Problem of Inflation eds. Brunner, K. and Meltzer, A.H. Carnegie - Rochester Conference Series on Public Policy North Holland

\_\_\_\_\_ (1979) "Three Aspects of Policy and Policy Making" Carnegie Rochester Conference Series Public Policy, 10.

Buiter, W.H. (1977) "Crowding Out and Effectiveness of



Fiscal Policy" Journal of Public Economics, 7

\_\_\_\_ (1980) "Private Capital Formation in the Presence of Intergenerational gifts and Bequests" Greek Economic Review

\_\_\_\_ (1982) "Deficits, Crowding Out and Inflation: The Simple Analytics" Center of Labour Economics, London School Of Economics, Discussion Paper, No 143

\_\_\_\_ (1982) "The Proper Measurement of government Budget Deficits: Comprehensive Wealth Accounting or Permanent Income Accounting for the Public Sector: Its Implication for Policy Evaluation and Design, Working Paper No 1013, N.B.E.R

\_\_\_\_ (1983) "The Theory of Optimum Deficits and Debt" London School of Economics and NBER, September 1983

\_\_\_\_ (1986) "A Guide to Public Sector Debt and Deficit" Economic Policy, November 1985.

Burger, H. (1973) "Possible Concepts for Better Planning and Evaluating Fiscal Policy" in Giersch, H. ed. Fiscal Policy and Demand Management

\_\_\_\_ (1975) "Structural Budget Policy in the Netherlands" De Economist 123

Cagan, P (1956) "The Monetary Dynamics of Hyperinflation" in Fridman, M ed. Studies in the Quantity Theory of Money Chicago: University Press

Canavese, A. Y. (1982) "The Structuralist Explanation in the Theory of Inflation" World Development, 10.

Cargill, T. (1979) "Money, The Financial System and Monetary Policy"

Carlson, K.M. & Spencer, R.W. (1975): "Crowding out and

its Critics " Federal Bank of St. Louis Review

Chand, S. K. ( 1977) "Summary Measures of Fiscal Influence" International Monetary Fund Staff Papers 24

Choundhry, N. (1975) "A Study of the Elasticity of the West Malaysian Income Tax System" International Monetary Fund Staff Papers 22

\_\_\_\_\_ (1977) " the Treatment of Indirect Taxation, in Econometric Models" International Monetary Fund Staff Papers 24

Christ, C. (1968) "A Simple Macroeconomic Model with a Government Constraint" Journal of Political Economy, 76

\_\_\_\_\_ (1969) " A Model of Monetary and Fiscal Policy Effects on the Money Stock Price level and Real Output" Journal of Money Credit and Banking, 1

Clark, P. K. "Potential GNP in the U.S.A.

\_\_\_\_\_ (1979) "Investment in the 1970's. theory, Performance and Protection" Brookings Papers On Economic Activity.

Claassen, E. & Salin, P. (1976) ed. Recent Issues in International Monetary Economics North-Holland

Clement, M. O. (1960) "The Quantitative Impact of Automatic Stabilizers" Review of Economics and Statistics

Clower, R. & Lipsey, R. (1968) "The present state of international liquidity theory" American Economic Review 57

Coen, R. M. (1971) "The Effect of Cash Flow on the Speed of Adjustment" in Tax Incentives and Capital

- Spending Fromm G. ed. The Brookings Institution  
 (1975) "Investment Behavior. The Measurement of  
 Depreciation and Tax Policy" American Economic  
 Review, 65.
- Cook, S.T. & Jackson, P.M. (1979) Current Issues in  
 Fiscal Policy Martin Robertson
- Crockett, A. (1981) "Stabilization Policies in  
 Developing countries" International Monetary Fund  
 Staff Papers 28
- Cukierman, A & Mortensen, J. (1983) "Monetary assets and  
 Inflation Induced Distortions of the National  
 Accounts. Conceptual Issues and Corection of  
 Sectoral Income Flows in 5 EEC Countries" Internal  
 Paper, No 15, Economic Papers, Commission of the  
 European Communities. Directorate-General for  
 Economic and financial Affairs.
- Currie, D.A. (1976) "Optimal Stabilization Policies and  
 the Government Budget Constraint" Economica, 43
- David P.A. & Scadding J.L. (1974) "Private Savings:  
 Ultrarationality, Aggregation and Denison's Law"  
Journal of Political Economy, 82
- Davies, D.G. (1962) "The Sensitivity of Consumption  
 Taxes to Fluctuations in Income" National Tax  
 Journal, Sep. 1962
- Demopoulos, G.D. (1981) "Monetary Policy in the Open  
 Economy of Greece" Center of Planning and Economic  
 Research Athens
- Dernburg, T.F (1977) "Fiscal Analysis in the Federal  
 Republic of Germany :The Cyclical Neutral Budget"  
International Monetary Fund Staff Papers 24



Devlonet, C. (1977) "The Specification of the Demand for Money and the Built in Flexibility of the Taxation in a Multiplier-acceleration Model" Public Finance, 32

Dhrymes, Ph. (1969) "Efficient Estimates of Distributed Lags with Autocorrelated Error Terms" International Economic Review 10

\_\_\_\_\_ (1971) "Distributed Lags: Problems of Estimation and formulation" San Francisco, Holladay.

Diamond, P. (1965) "National Debt in a Neoclassical Growth Model" American Economic Review,

Diamond, J. (1977) "The New Orthodoxy in Budgetary Planning. A Critical Review of Dutch Experience" Public Finance, 32

Dixon, D.A. (1972) "Techniques of Fiscal Analysis In the Netherlands", International Monetary Fund Staff Papers 19

\_\_\_\_\_ (1973) "The F.E.S Concept as a tool of Fiscal Analysis in the United States" International Monetary Fund Staff Papers 20

Donovan, D.J. (1982) "Macro-economic performance and adjustment under fund-supported programmes: the experience of the seventies" I.M.F. Staff Papers, 29

Dornbusch, R. (1975) "Exchange Rates and Fiscal Policy in a Popular Model of International Trade" American Economic Review, 65.

\_\_\_\_\_ (1976) "The Theory of Flexible Exchange Rate Regime and Macroeconomic Policy" Scandinavian Journal of Economics, 78.

\_\_\_\_\_ & Frenkel, J.A. (1979) "International Economic

## Policy"

Eisner, R. & Lanle, P.J. (1975) "Tax Policy and Investment. An Analysis of Survey Responses" American Economic Review, 65.

Eshag, Eprime (1982) "fiscal and Monetary Problems in Developing Countries" Modern Cambridge Economics.

Fama, E.F. (1975) "Short-Run Rates as Predictions of Inflation" American Economic Review, 65

Fertherston, M J. & Godley, W.A.H. (1978) " New Cambridge Macroeconomics and Global Monetarism: Some Issues in the Conduct of U.K." in Brunner, K. and Meltzer, A.M. ed. in Public Policies in Open Economies Carnegie-Rochester Conference Series on Public Policy, 9

Fisher, D. (1978) Monetary Theory and the Demand for Money Martin Robertson

Flemming, J. M. (1958) "Exchange Rate Depreciation, Financial Policy and Domestic Price Level" International Monetary Fund Staff Papers 6

\_\_\_\_ (1962) "Domestic Financial Policies under Fixed and Floating Exchange Rates" International Monetary Fund Staff Papers 9.

Foley, D.K. & Sidrauski, M. (1971) "Monetary and Fiscal Policy in a Growing Economy"

Foxley, Alejandro (1980) "Stabilization Policies and Stagflation the Case of Brasil and Chile" World Development, 8, No 11.

Frenkel, J. A ( 1974a) "Openness and the demand for International Reserves" in Monetary Policies and the International Financial System ed. Aliber,

R.Z. Chicago III University of Chicago Press

\_\_\_\_ (1974b) "The Demand for International Reserves by Developed and Less-Developed Countries" Economica, 41

\_\_\_\_ (1976a) "A Monetary Approach to the Exchange Rate" Scandinavian Journal of Economics, 78.

\_\_\_\_ (1976b) "The Monetary Approach to the Balance of Payments" London: Allen and Unwin, and Toronto: University of Toronto Press.

\_\_\_\_ (1978) "International Reserves: Pegged Exchange Rates and Managed Float" in Brunner, K. and Meltzer, A. H. eds. Public Policies in Open Economies Carnegie-Rochester Conference Series on Public Policy, 9

\_\_\_\_ (1980) "A Synthesis of Monetary and Keynesian Approaches to Short-Run Balance of Payments Theory" Economic Journal, 90.

Friedman, M. (1956) "The Quantity Theory of Money, A Restatement" in Friedman ed. "Studies in the Quantity Theory of Money" Chicago: University of Chicago Press.

\_\_\_\_ (1957) "A Theory of Consumption Function" Nat. Bureau of Economic Research.

\_\_\_\_ (1959) "The Demand for Money-Some theoretical and Empirical Results" Journal of Political Economy 69

\_\_\_\_ (1968) "The role of Monetary policy" American Economic Review 58

Frisch, H. (1983) Theories of Inflation Cambridge Surveys of Economic Literature

Fry, M. (1980) "Saving, Investment, Growth and the Cost



- of Financial Repression" World Development, 8
- \_\_\_\_ (1982) "Models of Financial Repressed Developing Economies" World Development, 10
- Galbis, V. (1979) "Money, Investment and Growth in Latin America, 1961-1973" Economic Development and Culture, 27.
- Giersch, H. ed. (1972) "Fiscal and Policy and Demand Management" Symposium, 1972
- Goldfield (1966) "Commercial Banks Behavior and Economic Activity"
- \_\_\_\_ (1973) "The Demand for Money Revisited" Brookings Papers on Economic Activity, 3
- Gordon, R.J. (1976) "Interrelations between Domestic and International Theories of Inflation" in Aliber, R.Z. ed. The Political Economy of Monetary Reform London Macmillan
- Gramlich, E.M. (1966) "The Behavior and Adequacy of the U.S.A Federal Budget 1952-1964" Yale Economic Essays, 6 No 1.
- Granger, C.W.J. (1964) Spectral Analysis of Economic Time Series Princeton: Princeton University Press
- \_\_\_\_ (1969) "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods" Econometrica, 37
- Griliches, Z. (1965) "The Determination of Investment Revisited" International Economic Review, 6
- \_\_\_\_ (1971) "A Note on the Serial Correlation Bias in Distributed Lags" Econometrica, 29
- \_\_\_\_ (1967) "Distributed Lags: A Survey" Econometrica,

- Hall, R. & Jorsenson D. W. (1967) "Tax Policy and Investment Behavior" American Economic Review, 57
- Hamburger, M.J. (1966) "The Demand for Money by Households, Money Substitutes and Monetary Policy" Journal of Political Economy, 74
- Hansen, B. (1973) "On the Effects of Fiscal and Monetary Policy. A Taxonomic discussion" American Economic Review, 63
- \_\_\_\_ (1968) Fiscal Policy In Seven Countries 1955-1965  
Paris, O.E.C.D.
- Heller, P. (1980) "Impact of Inflation on fiscal Policy" International Monetary Fund Staff Papers 27
- Hendler, R.H. (1975) "Lancaster's Approach to the Consumer Demand and its Estimation" American Economic Review, 65
- Ho, H. C. Y. (1974) "A Measurement of Fiscal Performance in Hong-Kong" Malayan Economic Review, 19
- Hymans, S. h. & Wernette, J. P. (1970) "The Impact of The Federal Budget on Total Spending" Business Economics, 5
- Jae Wan Chunng (1982) "Inflation in a Newly Industrialized Cluntry: The Case of Korea" World Development, vol 10.
- Jaffee, D.M. (1971) "Credit Rationing and The Commercial Loan Market."
- Jaud Ott, D. & Korb, L.J. (1973) "Public Claims on U.S output" American Enterprise Institute for Public Policy Research, Washington DC.
- Johnston, (1972) "Econometric Models," 2nd edition, N.Y Mc Graw-Hill.

Jorgenson, D. W. (1964) "Capital Theory and Investment Behavior" American Economic Review, 53-54.

\_\_\_\_ (1967) "The Theory of Investment Behavior" in Determinants of Investment Behavior Ferber R. ed. National Bureau of Economic Research, New York.

Jump, G. V. (1980) "Interest Rates, Inflation Expectations and spurious elements in Measured Real Income and savings" American Economic Review, December 1980.

Karavitis, N. (1986) "Causal Factors of Government Expenditure Growth in Greece, 1950-1980" Applied Economics forthcoming.

Katz, E. (1977) "The Efficacy of Fiscal and Monetary Policies under Floating Exchange Rates: The Implications of Capital Mobility Reconsidered" Queen Mary College (London) Discussion Paper in Economics

Keller, P. (1980) "Implications of Credit Policies for Output and the Balance of Payments" International Monetary Fund Staff Papers 27

Kelly, M. (1980) "Fiscal Content of Financial Programms Supported by Stand-by Arrangements" International Monetary Fund Staff Papers 27

Kenen, P.B. & Yudin, E.B. (1965) "The Demand for International Reserves" Review of Economics and Statistics 47

Kertzam, E. (1972) "The Development of Dutch Public Finance During the Period 1957-69." Finanzarchiv, 31



Keynes, J.M (1930) " A Treatise on Money" London and New York: Macmillan

\_\_\_\_\_ (1936) "The General Theory of Employment, Interest and Money" London

Khan, M. S. (1974a)" Import and Export Demand in Developing countries" International Monetary Fund Staff Papers 21

\_\_\_\_\_ (1974b) "The Stability of the Demand for Money Function in the U.S 1901-1965" Journal of Political Economy, 82

\_\_\_\_\_ & Heller, R. (1978) "The Demand for International Rservees Under Fixed and Floating Exchange Rates" International Monetary Fund Staff Papers 25

\_\_\_\_\_ & Knight, M. D. (1982) " Some Theoretical and Empirical Issues Relating to Economic Stabilization in Developing Countries". World Development, 10.

\_\_\_\_\_ (1983) "Determinantsof Current Account Balances of Non-Oil Developing countries in the 1970's: an Empirical Analysis" International Monetary Fund Staff Papers 30

Killick, T. (1982) ed. Adjustment and Financing in the Developing World The Role of the International Monetary Fund

Klein, L.R. (1974a) " The Use of Econmetric Models as a Guide to Fiscal Policy" Econometrica, 15

\_\_\_\_\_ (1974b) " The Competitive Supply of Money" Journal of Money Credit and Banking, 6

\_\_\_\_\_ (1978) "The Supply Side" American Economic Review,

Kmenta, (1973) "Autonomus Expenditure versus Money

- supply" Review of Economics and Statistics, 55
- Korliras, P & Thorn, S. (1979) "Modern Macroeconomics".
- Kouri, P. (1976) "The Exchange Rate and the Balance of Payments in the Short-run and in the Long-run. A Monetary Approach" Scandinavian Journal of Economics, 78
- Knight, M. (1983) "Determinants of CA Balances of Non-Oil Developing countries in the 1970's: An Empirical Analysis" International Monetary Fund Staff Papers 30
- Korteweg, P. (1978) "The Economics of Inflation and Output Fluctuations in the Netherlands, 1954-1975: A Test of Some Implications of the Dominant Impulse-cum-Rational Expectations Hypothesis" in The Problem of Inflation eds. Brunner, K. and Meltzer, A.H. Carnegie-Rochester Conference Series on Public Policy North-Holland
- Koyck, L. M. (1954) "Distributed Lags and Investment Analysis" North-Holland 1954.
- Krueger, Anne (1965) "Alternative government Policies under Varying Exchange Systems" Quarterly Journal of Economics, 79
- \_\_\_\_ (1983) "Exchange Rate Determination"
- Laidler, D. (1969) "Definition of Money: Theoretical and Empirical Problems" Journal of Money Credit and Banking.
- \_\_\_\_ (1977) The Demand For Money: Theories and Evidence Dun-Donnelley New York
- Leff, N. H. & Kazuo, S. (1975) "A Simultaneous Equations

- Model of Savings in Developing Countries" Journal of Political Economy, 83
- \_\_\_\_\_ & Sato, K. (1980) "Macroeconomic Adjustment in Developing Countries. Instability, Short-Run Growth and External Dependency" Review of Economics and Statistics, 62
- Lent, G.E. (1977) "Corporation Income Tax Structure in Developing countries." International Monetary Fund Staff Papers 24
- Lewis, "Budget Concepts of Economic Analysis" in Studies in Government Finance
- Lipschitz, L. (1984) "Domestic Credit and Exchange Rates in Developing Countries: Some Policy Experiments with Korean Data" International Monetary Fund Staff Papers 31
- Lipsey, R.G. (1960) "The relationship between unemployment and the rate of change of money wage rates in the U.K., 1862-1957: A further analysis" Economica 27
- Lotz, J. (1970) "Measuring the Effects of Fiscal Policy in Developing Countries" Finanzarchiv, 29
- \_\_\_\_\_ (1971) Techniques of Measuring the Effects of Fiscal Policy O.E.C.D. Economic Outlook Occasional Studies
- Lowinger, T.C. (1978) "Domestic Inflation and Exchange Rate Changes: The Less Developed Countries Case" Weltwirt Schatliches Archiv, 114, NO 1
- Lucas, R.B. (1976) "Econometric Policy Evaluation: A Critique" in Brunner, K. and Meltzer, A.N. eds. The Phillips Curve and Labour Markets, Amsterdam



North-Holland

- \_\_\_\_ & Sargent, T.J (1981) "Rational Expectations and Econometric Practice " Allen & Unwin
- Lucas, R. & Stokey, N. (1983) "Optimal Fiscal and Monetary Policy in an Economy Without Capital". Journal of Monetary Economics
- Lucas, R.E Jr. (1972) "Expectations and the Neutrality of Money" Journal of Economic Theory, 4
- Mathieson, D.J. (1977) "the Impact of Monetary and Fiscal Policy Under Flexible Exchange Rates and Alternative Expectations Structures". International Monetary Fund Staff Papers 30
- McKinnon, R.I. (1973) "Money and Capital in Economic Development" The Brookings Institution
- \_\_\_\_ (1980) "Financial Policies" in Policies for Industrial Progress in Developing Countries Cody, J. Hughes, H. and Wall, D. eds.
- Maurice, A (1969) "Growth and Inflation". Journal of Money Credit and Banking, 1
- Mayer, P.A & Neri, J.A. (1975) "A Keynes-Friedman Money Demand Function" American Economic Review, 65
- Meyer, L.H. (1974a) "Wealth Effects and the Effectiveness of Monetary and Fiscal Policy" Journal of Money Credit and Banking, 6
- \_\_\_\_ (1974b) "Lagged Adjustments in Simple Macro-Models" Oxford Economic Papers, 26
- \_\_\_\_ (1975) "The Balance Sheet Identity, The Government Financing Constrained and the Crowding Out Effect" Journal of Monetary Economics, 85
- \_\_\_\_ & Hart (1975) "On the Effects of Fiscal and

Monetary Policy, Completing the Taxonomy". American Economic Review, 65

Mishan, E.J. (1958) "Progressive Taxation". American Economic Review,

Miles, M.A. (1978) Devaluation The Trade Balance, and the Balance of Payments Business Economics and Finance Marcel Dekker, Inc. New York and Basel

Modiglianni, F. & Tarantelli, E. (1975) "The Consumption Function in A Developing Economy and the Italian Experience" American Economic Review, 65

Moravetz, D. (1971) "The Sensitivity of the Yield of Personal Income Tax in the U.K, A Note". The Economic Journal, 81

Morrison, T.K. (1982) "Structural Determinants of Government Deficit in Developing Countries" World Development, 10

Mundell, R. A. (1962) " The Appropriate Use of Monetary and Fiscal Policy for Internal and External Stability" International Monetary Fund Staff Papers

\_\_\_\_ (1963) " Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates" Canadian Journal of Economics and Political Science, 26

\_\_\_\_ (1968) International Economics New York Macmillan

Musgrave, (1963) "Evaluation of fiscal Performance" Proceedings of the Bussiness and Economic Statisitcs Section A.S.A

\_\_\_\_ (1964) "On Measuring Fiscal Performance". Review of Economics and Statistics. 46

Mussa, M.(1976) "The Exchange Rate, The Balance of Payments and the Monetary and Fiscal Policy Under a

Regime of Controlled Floating" Scandinavian Journal of Economics, 78

Nerlove, M. (1972) "Lags in Economic Behaviour"

Netherlands Ministry of Finance The Netherlands Budget Memorandum (abridged) annually

Niehans, J. (1975) "Some Doubts about the Efficacy of Monetary Policy under Flexible Exchange Rates" Journal of International Economics 5.

Oakland, W.H. (1969) "Budgetary Measures of Fiscal Performance" Southern Economic Journal, 35

Oates, W. (1966) "Budget Balance and Equilibrium Income: A Comment on the Efficacy of Fiscal and Monetary Policy" Journal of Finance, 21

O.E.C.D (1975) Employment Series No. 12; Development Center of O.E.C.D "Industrialization Employment and Income Distribution in Greece"

O.E.C.D (1976) "Public Sector Budget Balances" Mark Wasserman

O.E.C.D (1980) "Fiscal Policy Simulations with the O.E.C.D International Linkage Model"

O.E.C.D (1982) "Budget Financing and Monetary Control" Monetary Studies Series.

O.E.C.D (1982) "Government Debt Management Objectives and Techniques" vol 1

O.E.C.D (1983) "Debt Instruments" vol 2

O.E.C.D (1983) "Fiscal and Monetary Policies"

O.E.C.D (1983) "Public Sector Deficits: Problems and Policy Implications" Economic Outlook Occasional Studies

Okun, M. & Teeters, N. (1970) "The Full Employment



Surplus Revisited" Brookings Papers on Economic Activity 1

Oort, C.J. de Man, G. (1968) "The Zijlstra Standard in theory and Practice" Economic Quarterly Review 13  
Amsterdam-Rotterdam Bank

Papadakis, J, (1979) Money and Economic Activity  
I.O.B.E., Athens (in Greek)

Patinkin, D. (1965) Money, Interest and Prices New York  
\_\_\_\_ (1967) On the nature of Monetary Mechanism  
Stockholm

Peacock, A. (1967) "Stability Growth and Budgetary  
Planning" The Budget Today Semaine de Bruges

\_\_\_\_ (1969) "Quantitative Analysis in Public Finance"

\_\_\_\_ & Shaw, K.S. (1976) "The Economic Theory of Fiscal  
Policy"

Pesek, B. P. & Saving, T.R. (1967) Money, Wealth and  
Economic Theory New York McMillan.

Peston, M. H. (1971) "The Tax Mix and Effective Demand"  
Public Finance, 26

Perry, G.L. (1977) "Potential Output and Productivity"  
Brookings Papers on Economic Activity, 1

Phelps, E. (1967) "Philips Curve, Expectations of  
Inflation and Optimal Unemployment over Time"  
Economica, 34

\_\_\_\_ (1973) "Inflation in the Theory of Public Finance"  
Scandinavian Journal of Economics (1973)

Phillips, A.W. (1958) "The relation between unemployment  
and the rate of change of money wage rates in the  
U.K., 1861-1957" Economica 22

Pierce, D.A. & Haugh, L.D. (1977) "Causality in temporal systems" Applied economics 17

Plosser, C. I. & Schwert, G. W. (1979) "Potential GNP: Its Measurements and Significance. A dissenting Opinion." Carnegie Rochester Conference Series Public Policy, 10.

Polak, J. J. (1959) "Monetary Analysis of Income Formation and Payments Problems" International Monetary Fund Staff Papers 6

Poole, W. (1976) "Rational Expectations in the Macro model" Brookings Papers on Economic Activity, 2  
Washington DC: The Brookings Institution

Prest, A.R. (1962) "The Sensitivity of the Yield of Personal Income in the U.K" Economic Journal, 72

Provopoulos, G. A. (1977) "Incidence effects of the Greek Fiscal Structure, Some Theoretical and Empirical Aspects" Ph.D Thesis, Essex

Pui Chi Ip (1977) "Fiscal Policy and Stability in a Dynamic Macroeconomic Model with a Government Budget Constraint" Public Finance, 32

Raja, J.C. (1973) "Significance of Alternative concepts of Budget Deficit" International Monetary Fund Staff Papers 20

Saini, Krishan (1982) "The Monetarist Explanation of Inflation: The Experience of Six Asian Countries" World Development, 10

Sargent, T. J. & Wallace, N. (1975) "Rational Expectations, the Optimal Monetary Instruments and the Optimal Money Supply" Journal of Political Economy, 83

- \_\_\_\_ (1976) "Rational Expectations and the Theory of Economic Policy" Journal of Economics, 2
- Schwerk, G. W. (1979) "Test of Causality: The Message in the Innovation" Carnegie Rochester Conference Series On Public Policy, 10
- Shaw, E.S. (1973) "Financial Deepening in Economic Development" New York: Oxford University Press
- Sheehey, E. J. (1979) "On the Measurement of Imported Inflation in Developing Countries" Weltwirtschaftliches Archiv, 15
- Sheffrin, S.M. (1981) "Taxation and Automatic Stabilizers" Public Finance, 36
- Siegel, J. (1979) "Inflation-Induced Distortions in Government and Private Saving Statistics" Review of Economics and Statistics
- Silber, W.C. (1970) "Fiscal Policy in IS-LM Analysis" Journal of Money Credit and Banking, 2
- Sims, C.A. (1972) "Money, Income and Causality" American Economic Review, 62
- Smiths, G. (1975) "Pitfalls in Financial Model Building. A Clarification" American Economic Review, 65
- Smyth, D. J. (1966) "Built in Flexibility of Taxation and Automatic Stabilization" Journal of Political Economy
- \_\_\_\_ (1968) "The Measurement of Fiscal Performance" Economic Record, 44
- Solomon, R. (1962) "The F.E.S as an Analytical Concept" Proceedings of the Business and Economics Statistics Section A.S.A
- \_\_\_\_ (1964) "A Note on the full Employment Budget



Surplus" Review of Economics and Statistics 46

Stein, J. L. (1969) "Neoclassical and Keynesian Monetary Growth Models" Journal of Money Credit and Banking, 1

Stevens, A. (1967) "Some Aspects of the Impact of Social Developments on Public Finance" The Budget Today  
Semaine De Bruges

Stiglitz, J. & Weiss, A. (1981) "Credit Rationing in Markets with Imperfect Information" American Economic Review

Sundarjan, V. & S. Thakur (1980) "Public Investment, Crowding-out and Growth: a Dynamic Model applied to India and Korea" International Monetary Fund Staff Papers 27

Tanzi, V. (1976) "Fiscal Policy, Keynesian Economics and the Mobilization of Savings in Developing Countries" World Development 4

\_\_\_\_ (1978) "Inflation, Real Tax Revenue and the Case of Inflationary Finance" International Monetary Fund Staff Papers, 25

Tatom, J. A. (1979) "The Meaning and Measurement of Potential Output. A comment on the Perloff and Wachter Result" Carnegie Rochester Conference Series Public Policy, 10.

Taylor, L.D. & Wilson, T.A. (1964) "Three Pass Least Squares: A Method of Estimating Models with a Lagged Dependent Variable" Review of Economics and Statistics, 46

Teeters, N. (1965) "Estimates of F.E.S" Review of

Economics and Statistics, 47

Tobin, J. (1961) "Money Capital and Other Stores of Value" American Economic Review

\_\_\_\_ (1965) "Money and Growth" Econometrica

\_\_\_\_ (1969) "General Equilibrium Approach to Monetary Theory" Journal of Money Credit and Banking, 1

\_\_\_\_ (1980) "Fiscal and Monetary Policies, Capital Formation and Economic Activity" in The Government and Capital Formation ed. Furstenberg, G. M. Ballinger, Cambridge, Mass

Turnovsky, S. & Brock, W. (1980) "Time-Consistency and Optimal Government Policies in Perfect Foresight Equilibrium" Journal of Public Economics

von Furstenberg, G.M. (1980) "Domestic Determinants of Net U.S. Foreign Investment" International Monetary Fund Staff Papers 27

\_\_\_\_ & Malkiel, B.G. (1977) "The Government and capital Formation: A Survey of recent issues" Journal of Economic Literature 15

Wallis, K. (19667) "Lagged Dependent Variables and Serially Correlated Errors: A Reappraisal of Three-Pass Leasr Squares" Review of Economics and Statisitcs, 49

Ward, T.S. & Neild, R.R (1978) "The Measurement and Reform of Budgetary Policy"

Webb, D. (1980) "The NEt Wealth Effects of Governemnt Bonds When Credit Markets are Imperfect" Economic Journal

- Williamson, J. (1976) "Exchange Rate Flexibility and Reserve Use" Scandinavian Journal of Economics, 78
- Wong, K.P. (1974) " a monetary Model of Singapore's Monetary Sector" Malayan Economic Review, 19
- de Wolff, P and Steevers, T.A. (1962) " State Budget and Planning in Prceedings of the Public Finance Warsaw Conference
- World Development (1982) volume 10 Special Issue "Analysing Disequilibrium in Developing Countries"
- Zellner, A. (1979) "Causality and Econometrics" Carnegie Rochester Conference Series On Public Policy, 10.